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# A Yoga Intervention For Substance Use And Stress For Returning Citizens

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# A Yoga Intervention For Substance Use And Stress For Returning Citizens

## **Abstract**

**Background:** Citizens with HIV and substance use problems returning from prison or jail experience numerous serious health outcomes, which is unsurprising given the challenges faced. Interventions are needed to relieve stress as a pathway to reduced substance use and improved health outcomes. Yoga is one intervention associated with stress-reduction, but there is limited research regarding yoga's effect on substance use. Additionally, yoga in the U.S. is marketed towards White women so that people of color are sometimes excluded from practice. To fill these gaps, this randomized controlled trial explored yoga's effect on the well-being of returning citizens with HIV and substance use problems, an underrepresented group in U.S. yoga studios. **Methods:** Thirty-two people were randomized to treatment as usual (TAU) and 32 people were randomized to a 12-week hatha yoga intervention. The yoga and TAU groups were compared on 1.) stress, antiretroviral therapy (ART) adherence, blood pressure and pulse at three-months post-baseline, controlling for the respective baseline dependent measure using analysis of covariance, and 2.) percentage of days of drug use at one, two and three-months post-baseline controlling for baseline drug use using generalized estimating equations. Qualitative interviews completed at three-months post-baseline explored yoga participants' perceptions of the intervention. Transcripts were analyzed using thematic analysis. **Results:** Treatment condition comparison on mean stress reduction was significant [ $F(1,59)=9.24, p<.05$ ], with yoga participants experiencing greater stress-reduction. Treatment condition comparison on percentage of days of substance use was significant [ $X^2(1)=11.47, p<.001$ ], with yoga participants using substances on 20 % of the days and TAU using substances on 41 % of the days between baseline and program completion. There was no statistically significant effect on pulse, blood pressure or ART adherence. Qualitative interviews highlighted that yoga participants experienced social support, health improvements, and a feeling of well-being that complemented substance use recovery. **Conclusion:** Yoga can support well-being outcomes, including reduced stress and substance use among returning citizens with HIV and substance use problems.

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Alexandra Schepens Wimberly

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2017

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A YOGA INTERVENTION FOR SUBSTANCE USE AND STRESS FOR

RETURNING CITIZENS

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Alexandra Schepens Wimberly

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## ABSTRACT

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**Background:** Citizens with HIV and substance use problems returning from prison or jail experience numerous serious health outcomes, which is unsurprising given the challenges faced. Interventions are needed to relieve stress as a pathway to reduced substance use and improved health outcomes. Yoga is one intervention associated with stress-reduction, but there is limited research regarding yoga's effect on substance use. Additionally, yoga in the U.S. is marketed towards White women so that people of color are sometimes excluded from practice. To fill these gaps, this randomized controlled trial explored yoga's effect on the well-being of returning citizens with HIV and substance use problems, an underrepresented group in U.S. yoga studios. **Methods:** Thirty-two people were randomized to treatment as usual (TAU) and 32 people were randomized to a 12-week hatha yoga intervention. The yoga and TAU groups were compared on 1.) stress, antiretroviral therapy (ART) adherence, blood pressure and pulse at three-months post-baseline, controlling for the respective baseline dependent measure using analysis of covariance, and 2.) percentage of days of drug use at one, two and three-months post-baseline controlling for baseline drug use using generalized estimating equations. Qualitative interviews completed at three-months post-baseline explored yoga participants' perceptions of the intervention. Transcripts were analyzed using thematic

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## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENT.....</b>	<b>iii</b>
<b>ABSTRACT.....</b>	<b>iv</b>
<b>INTRODUCTION .....</b>	<b>1</b>
<b>REVIEW OF THE LITERATURE .....</b>	<b>4</b>
Stress in Reentry.....	4
Conceptual Model of the Connection between Stress and Substance Use.....	5
Yoga.....	6
Yoga’s Effect on Substance Use .....	15
Yoga’s Effect on HIV Medication Adherence .....	17
Research Significance.....	18
<b>METHODOLOGY .....</b>	<b>19</b>
Participants & Setting.....	19
Treatment Conditions .....	20
Randomization Procedures .....	22
Assessments.....	22
Baseline/Three Month Follow-up Measures .....	23
Mixed Methods Justification .....	26
<b>QUANTITATIVE DATA ANALYSES .....</b>	<b>27</b>
<b>QUALITATIVE DATA ANALYSIS .....</b>	<b>31</b>
<b>QUANTITATIVE DATA RESULTS.....</b>	<b>33</b>
Comparison of Treatment Conditions at Baseline.....	33
Implementation of Yoga Intervention .....	37
Follow-up Rates.....	38
Viral Load.....	38
Stress.....	39
Substance Use.....	40
ART Medication Adherence, Heart Rate, and Blood Pressure .....	42
Predictors of stress.....	45
Predictors of substance use.....	46
<b>QUALITATIVE RESULTS.....</b>	<b>47</b>
Social support .....	47
An Unfamiliar Experience: Both a Strength and a Challenge of Classes .....	48
Taking Care of One’s Self.....	50
Effects of Yoga Practice .....	51
Yoga’s Effect on Substance Use .....	55
Preferred Yoga Activity.....	58
Yoga Instruction .....	59
Challenges with Yoga Practice.....	62
Yoga Practice Outside of Class .....	64
Barriers to yoga attendance .....	65
Reasons for yoga attendance .....	67
Recommendations for Yoga Practice .....	68



<b>FIDELITY TO YOGA CURRICULUM .....</b>	<b>70</b>
Intention.....	71
Breath.....	71
Guided relaxation .....	71
Upright seat.....	71
Balancing.....	71
Simplicity.....	72
<b>DISCUSSION .....</b>	<b>73</b>
Primary Outcome: Stress.....	73
Primary Outcome: Substance Use .....	74
Alternative Hypothesis to Explain Change in Primary Outcomes .....	78
Secondary Outcome: ART Medication Adherence .....	80
Effects of Attendance .....	81
Yoga Classes.....	83
Strengths and Limitations.....	86
Conclusion.....	87
<b>THE EIGHT LIMBS OF YOGA .....</b>	<b>88</b>
<b>YOGA CURRICULUM FOR YOGA INSTRUCTORS.....</b>	<b>91</b>
<b>YOGA CLASS FOUR HANDOUT.....</b>	<b>111</b>
<b>YOGA CLASS EIGHT HANDOUT .....</b>	<b>112</b>
<b>THREE-MONTH QUALITATIVE INTERVIEW QUESTIONS.....</b>	<b>114</b>
<b>CODES GENERATED FROM QUALITATIVE ANALYSIS .....</b>	<b>116</b>
<b>ADJUSTMENTS TO YOGA CURRICULUM.....</b>	<b>119</b>
<b>REFERENCES.....</b>	<b>121</b>

## LIST OF TABLES

<b>Table 1. Baseline Characteristics of People Randomized to Yoga versus TAU...</b>	<b>35-37</b>
<b>Table 2. Counts and Percentages of Viral Load Status at Baseline and Month Three.....</b>	<b>39</b>
<b>Table 3. Normality Tests for Dependent Variables.....</b>	<b>43</b>
<b>Table 4. Three Month Mean Values for Blood Pressure and ART Medication Adherence by Treatment Condition and Test Statistics from ANCOVA Analyses..</b>	<b>44</b>
<b>Table 5. Effect Sizes for Stress and Substance Use.....</b>	<b>45</b>

## **LIST OF FIGURES**

**Figure 1. Percentage days of substance use by treatment condition and month....41**

## **CHAPTER ONE**

### **INTRODUCTION**

People in prison in the United States experience alarmingly higher rates of HIV and substance use problems than people in the general population, with rates of HIV five times higher (Center for Disease Control and Prevention, 2012; Maruschak, 2015), and rates of substance use problems five to seven times higher (Karberg & James, 2005; Mumola & Karberg, 2006; NIDA, 2011). This disproportion in health problems is made more troubling by the high incarceration rate of people who are African American or Latino (Mauer & King, 2007), exacerbating health disparities between people who are White and people of color. One study found that the rise in imprisonment between 1970 and 2000 among Black men largely explained the greater HIV infection rates for Black men and women as compared with White men and women during the same time period (Johnson & Raphael, 2009).

When people with HIV and substance use problems are released from prison, they experience dire health outcomes. In the two weeks following release from prison, drug overdose is the leading cause of death of returning citizens, accounting for 70 % of all deaths during that time period (Binswanger et al., 2007). Further, people with HIV who inject drugs and have been incarcerated experience virological failure more than two times as often as injection drug users who have not been incarcerated. (Westergaard, Kirk, Richesson, Galai, & Mehta, 2011).

Poor health outcomes for returning citizens are unsurprising given the extraordinary stress of reentry. The overwhelming logistical challenges, such as finding housing and employment, and reconnecting with friends and family are made more

difficult by emotional distress re-adjusting to freedom in a home environment that has likely changed (Mallik-Kane & Visher, 2008; Western, Braga, Davis, & Sirois, 2015). The people who are hit hardest by these stressors include people with substance use problems and people with physical health problems (Mallik-Kane & Visher, 2008; Western et al., 2015). Stress during reentry is especially problematic for people with substance use problems because using drugs is often their main strategy to manage stressful experiences (Sinha, 2008). In turn, substance use interferes with antiretroviral therapy adherence (ART; Baum et al., 2009; Hinkin et al., 2007) and hastens progression of HIV both directly and indirectly through poor ART adherence (Baum et al., 2009).

It follows that easing the stressors of reentry has the potential to improve health outcomes for people with HIV and substance use. Stress-reduction interventions are crucial to facilitate managing this challenging time and provide support to tackle logistical and emotional challenges. Additionally, substance use interventions that improve one's stress response in high stress situations have the potential to reduce substance use (Sinha, 2008).

One potential intervention that has demonstrated efficacy in alleviating stress is yoga. An age-old practice, yoga has been modified throughout the years with changing population ideals and expansion of the practice from Southeast Asia to the United States and beyond. As yoga has grown in popularity, so has research looking at its effects. However, there is limited research that examines yoga's effect on substance use. Additionally, yoga has been critiqued for being marketed exclusively towards White women in the United States and excluding people of color (Patankar, 2014).

The current study responds to the need for stress-reduction interventions that can reduce substance use. This study examines the effects of yoga on stress, substance use and ART adherence among a population that is under great stress, returning citizens with HIV and substance use problems. Further, this study responds to critiques on yoga's limited reach and exclusivity by exploring its acceptability among a population that is underrepresented in the modern yoga studio in the United States. Towards these ends, this study asks the following questions:

- Do returning citizens with HIV and substance use problems who are randomized to a yoga intervention experience less stress, less substance use and higher ART adherence than returning citizens with HIV and substance use problems who are randomized to treatment as usual?
- How is the yoga intervention received among those study participants randomized to the yoga intervention?

## **CHAPTER TWO**

### **REVIEW OF THE LITERATURE**

#### **Stress in Reentry**

The challenges that returning citizens face are numerous, including coping with physical and behavioral health complications (Mallik-Kane & Visser, 2008; Massoglia, 2008) the stigma of a criminal record (Pager, 2003), housing and financial insecurity (Western et al., 2015), and the loss of numerous public benefits and rights (Chen, 2012). These interconnected challenges make daily living extremely arduous. Coined “the stress of transition,” reintegrating into one’s community is particularly anxiety laden when struggling with the after-effects of the isolation of incarceration and having little to no material means, all in a world that is likely different than when one entered prison (Western et al., 2015). It is unsurprising that people with a history of incarceration are more likely than people without a history of incarceration to contract stress-related illnesses (Massoglia, 2008).

Those who are most vulnerable to “the stress of transition” include people with substance use problems because they have fewer resources, such as supportive family members (Western et al., 2015). With an inability to manage the overwhelming stressors of reentry, the stress can accumulate, inhibit social reintegration (Western et al., 2015), and place people who use drugs to cope with stress at risk for resuming substance use (Sinha, 2008). Indeed, qualitative interviews indicate that accessing healthcare and experiencing homelessness are particularly stressful experiences for people transitioning from prison to the community and can lead to increased risk of drug overdose and suicide

(Binswanger et al., 2011). For people with HIV in addition to substance use problems, the reentry process is made even more difficult by the added stressor of coordinating HIV medical treatment. Among people who use injection drugs, recent incarceration has been associated with discontinuation of ART (Kerr et al., 2005) and with virological failure when the incarceration was brief (Westergaard et al., 2011).

In sum, stress in reentry is worrisome for people with HIV and substance use problems because of its deleterious impacts on substance use (Sinha, 2008), ART adherence (Sheldon Cohen, Janicki-Deverts, & Miller, 2007), and HIV progression (Leserman et al., 2002). In addition, substance use, and in particular substance use to cope with stress, is associated with decreases in ART adherence (Arnsten et al., 2002; Gonzalez, Mimiaga, Israel, Bedoya, & Safren, 2013). Because of the varying routes in which stress negatively affects this population, attention to stress management is an important strategy to support reduced substance use and increased ART adherence. Decreases in stress and substance use are associated with improved medication adherence, pointing to the potential for interventions that decrease stress and substance use to improve ART adherence (French, Tesoriero, & Agins, 2011).

### **Conceptual Model of the Connection between Stress and Substance Use**

Most major theories of addiction highlight the role of stress in increasing one's substance use to manage stress (Sinha, 2001). The stress reaction includes appraisal, response and adaptation to environmental factors that are perceived as harmful (Lazarus & Folkman, 1984). According to Sinha (2008), stress challenges one's emotional and physical being, producing distress and arousal of the sympathetic nervous system. The current study draws on Sinha's (2008) model to explain how stress increases the risk of



drug use problems among returning citizens. Each person has genetic and individual vulnerability factors for drug use, such as individual differences in how substances affect him/her. Each person also has varying levels of exposure to chronic stressors and/ or early adverse events. In concert, these vulnerability factors can affect neurobiological pathways, increasing the risk of a compromised stress response (such as slow recovery to baseline) and putting that person at greater risk of using alcohol or drugs when faced with a stressor (Sinha, 2008).

The yoga intervention in this study aims to improve stress reactivity. It is hypothesized that participation in the yoga intervention will regulate the body's stress response by teaching coping skills such as breathing techniques and physical postures, which have been shown to reduce stress. By learning techniques that can reduce stress reactivity, a person will have more capacity to respond adaptively in high-risk situations, which will reduce the risk of substance use as a stress management strategy (Sinha, 2008).

With regard to ART adherence, a decrease in perceived stress and substance use will facilitate a less chaotic and unpredictable lifestyle, which can support better ART adherence (Hinkin et al., 2007). Higher levels of ART adherence are associated with improved virological, immunological and clinical outcomes (Paterson et al., 2000; Sethi, Celentano, Gange, Moore, & Gallant, 2003). As such, increased ART adherence can decrease HIV-1 RNA viral load.

## **Yoga**

Research has demonstrated decreases in stress among a variety of populations who practice yoga (Li & Goldsmith, 2012). Systematic reviews looking at the impact of

yoga on stress conclude that while yoga is a beneficial ancillary treatment for stress, the lack of studies with methodological rigor preclude a recommendation of yoga as a stand-alone treatment for stress management. (Li & Goldsmith, 2012; Macy, Jones, Graham, & Roach, 2015). The present study addresses some of these methodological limitations by utilizing random assignment and a sufficient sample size.

**Defining yoga.** Yoga is not easily defined due to the breadth of types of yoga and the various components to the practice. Yoga is comprised of eight limbs or components. Through practice, a yoga practitioner aims to reach the final limb of Samadhi (integration), in which the practitioner attains union with the object of meditation (see Appendix A for a definition of the eight limbs). While many forms of yoga exist, the predominant form practiced in the West is Hatha, combining asanas (physical postures), pranayama (breath control) and dhyana (meditation) to cultivate deeper relaxation and meditation (Saraswati & Hiti, 2008). Asanas, pranayama and dhyana reflect just three of the eight limbs of yoga. Yoga practice today places greater emphasis on physical postures, a shift from a century before when physical practice was a component, but not a focus of yoga practice.

This focus on physical movement has drawn critiques that such practice does not honor the yoga tradition. However, others argue that the focus on physicality makes yoga more accessible to a wider range of people and reflects society's shifting focus to physical health and exercise. While often solely attributed to Western appropriation of yoga, the focus on physicality occurred both in the West and East in the past century, based on cultural shifts that privileged the modernization and medicalization of yoga practice (Alter, 2004).

Another challenge to yoga practice is that many yoga practitioners in the West have been critiqued for cultural appropriation and misrepresentation of an Eastern practice. For example, the Hindu American Foundation (a Hindu advocacy organization) started the “Take Back Yoga” campaign in which it was argued that all yoga was rooted in the Hindu religion, and, as such, should reflect this history in its practice. Others challenge this view point, with some people arguing that yoga existed before the beginning of Hinduism, and some people arguing that yoga has amalgamated to different forms by different people throughout the years (Nanda, 2011).

This “Take Back Yoga” campaign helped spark a conversation and dialogue about the modernization of yoga and the implications for practice in the United States (Gregoire, 2013). These critiques are mainly that yoga is a commercialized practice targeted to White women with middle and upper class incomes and is therefore, less accessible to other groups, including people with limited financial means and people of color. This study will increase the reach and accessibility of yoga to under-represented persons, including returning citizens in Philadelphia who are largely people of color with limited socioeconomic resources.

**Potential mechanisms behind yoga.** Within the research world, there is interest in understanding yoga’s mechanisms, particularly as they relate to each of yoga’s different components. One review looking at yoga’s impact on anxiety and depression found that breath work, meditation, physical postures and yoga philosophy can each positively affect brain neurochemistry and improve the body’s stress response (Forfylow, 2011). Other research points to the important role of breathing exercises and meditation in yoga practice. For example, a meta-analysis of the research on yoga and depression

found that meditation and breathing based yoga interventions were more effective in reducing depression than complex (multiple components including physical postures) or exercise based interventions (Cramer, Lauche, Langhorst, & Dobos, 2013). In another study, incarcerated men assigned to a yoga and meditation group experienced greater improvements on anxiety and psychoticism scales than yoga only, meditation only or a delayed control group (Bunk, 1978). Therefore, it may be that a combination of yoga components (particularly breath work and meditation) are key to bring about the greatest gains from yoga. This possibility is in line with yoga philosophy that says that each of yoga's components build on top of each other and are necessary components to lead to a fulfilling meditation practice. While consideration of the effect of different yoga components is important, it is likely that separating out each component reduces its efficacy (Kirkwood, Rampes, Tuffrey, Richardson, & Pilkington, 2005). Further, yoga's mechanism is likely multifaceted and so cannot be pinned down to just one factor (Kirkwood et al., 2005). Research considers biological, social, cognitive and behavioral mechanisms behind how yoga impacts stress.

**A biological perspective.** When faced with a stressor, the brain alerts the rest of the body through the autonomic nervous system (Harvard, 2011). The autonomic nervous system takes care of all involuntary body functions (like breathing and the heart beating) and is made up of the sympathetic nervous system and the parasympathetic nervous system. The sympathetic nervous system triggers one's fight or flight response, providing the needed energy to respond to a stressor, while the parasympathetic nervous system takes over once the threat is gone, restoring the body to calm. When the sympathetic nervous system is activated, adrenaline is released into the blood, causing the heart to

beat faster and breathing to become rapid, thereby bringing in extra oxygen to increase alertness (Harvard, 2011). After the initial surge of adrenaline subsides, and if the danger continues to exist, the brain activates the hypothalamic-pituitary-adrenal axis, releasing cortisol to help sustain the hyper-alert state of the body. As cortisol levels rise, the neurotransmitter, gamma-aminobutyric acid (GABA) declines, a natural calming agent (Streeter et al., 2012). When the threat leaves, and the brain recognizes this change, it communicates with the parasympathetic nervous system to reduce the stress response, lowering cortisol levels and returning heart rate and breath to normal rates (Harvard, 2011; Streeter et al., 2012).

Activation of the sympathetic nervous system is good in the short term to correctly react to stressors, but too much activation can hurt the body in the long run, reducing the body's flexibility to respond to stressors and return to calm in a timely manner (Streeter et al., 2012). One biological indication of a compromised stress response is low heart rate variability, meaning the heart is unable to easily modify the time between beats. Under-activity of the parasympathetic nervous system (as exemplified by decreased heart rate variability) leads to greater dependence on the sympathetic nervous system, which can lead to health problems such as hypertension, heart attack and stroke (Streeter et al., 2012).

Yoga is hypothesized to regulate the stress response by correcting imbalances in the autonomic nervous system through decreasing sympathetic nervous system activity and increasing parasympathetic nervous system activity (Brown & Gerbarg, 2005; Streeter et al., 2012). One hypothesis is that yoga directly stimulates the vagal nerve (Brown & Gerbarg, 2005; Innes, Bourguignon, & Taylor, 2005), one of the key nerves in

the parasympathetic nervous system that communicates signals from the central nervous system to the body (Streeter et al., 2012). In addition, yoga may play a role in regulating neurotransmitters such as GABA (Streeter et al., 2007) and dopamine (Kjaer et al., 2002), which has positive implications for stress reduction due to known associations between stress and dysregulation of neurotransmitters (Isovich, Mijster, Flugge, & Fuchs, 2000; Tafet et al., 2001).

The biological mechanism behind yoga's effect on stress may also depend on the type of yoga. More intensive yoga sessions have found increases in heart rate, similar to what one might expect from exercise, yet more gentle forms of yoga have not (Cowen & Adams, 2007). Breathing exercises may also be key to yoga's efficacy in impacting stress (Brown & Gerbarg, 2005; Streeter et al., 2012). When voluntarily controlled, breathing sends messages to the brain via the vagal nerve, thus affecting how the brain responds to stress. Any changes in breathing patterns are noticed immediately because breathing is necessary for survival, thereby having instant impact on brain functioning (Streeter et al., 2012).

In sum, stress causes an imbalance of the autonomic nervous system by increasing sympathetic and decreasing parasympathetic nervous system activity. In addition, this imbalance is associated with under-activity of GABA, which is important for feeling calm. Yoga corrects this imbalance so that the brain can respond more efficiently to a threat. As the central regulatory systems work better, stress takes less of a toll on the body.

Yoga research has demonstrated decreases in cortisol, increases in heart rate variability and increases in GABA that support the hypothesis that yoga tones the

parasympathetic nervous system (Streeter et al., 2012). For example, one small pilot study found that experienced yoga practitioners had a significant rise in GABA levels after 60 minutes of practice in comparison to people who read for 60 minutes (Streeter et al., 2007). Another study looked at heart rate variability among healthy yoga practitioners and found significantly greater heart rate variability when practicing yoga as compared to engaging in a relaxation intervention and to being in a control group (Khattab, Khattab, Ortak, Richardt, & Bonnemeier, 2007).

While yoga studies have demonstrated decreases in cortisol, there are inconsistent results, which is partially due to methodological issues, such as small sample sizes, lack of control groups and insufficient cortisol samples to take into account the fluctuations in one's diurnal rhythms (Cramer et al., 2013; Li & Goldsmith, 2012). In addition, this measure is problematic because cortisol secretion is not specific to stress. Cortisol is released from one's adrenal glands not only when under stress, but also related to fluctuations in one's circadian rhythms and to imbalances in the hypothalamic-pituitary-adrenal axis (Li & Goldsmith, 2012). One study found no change in cortisol among people with HIV who used crack cocaine who practiced yoga as compared to a control group (Agarwal, Kumar, & Lewis, 2015). Limitations of the study included that only one sample of salivary cortisol was collected, there was a small sample size, and follow-up rates were low among the control group. In addition, authors posit that the two month, twice weekly 60-minute intervention was not long enough to impact cortisol levels (Agarwal et al., 2015). In another study, there were significant reductions in plasma cortisol among people with alcohol use problems who participated in Sudarshana Kriya Yoga (specific breathing technique), as compared to a treatment as usual control group

(Vedamurthachar et al., 2006). These studies suggest that cortisol results in yoga studies are equivocal, because it is not always collected properly.

Other indirect outcome measures of stress used in yoga studies include vital signs such as heart rate and blood pressure (Li & Goldsmith, 2012). The current study utilizes these measures as a marker of the stress response because they are more feasible and less invasive to collect than cortisol, represent measures that have positive health outcomes if a decrease is indeed shown, and inform the study intervention by contraindicating certain yoga poses for people with high and low blood pressure. Yoga studies have shown significant decreases in resting heart rate of between 4-12 beats per minute, decreases in systolic blood pressure of between 5 and 25 millimeters of mercury (mmHg), and decreases of between 3 and 17 mmHg in diastolic blood pressure (Cade et al., 2010; Carlson, Speca, Faris, & Patel, 2007; Damodaran, Malathi, Patil, Shah, & Marathe, 2002; Mccaffrey, Ruknui, Hatthakit, & Kasetsoomboon, 2005; Sivasankaran et al., 2006).

Research also demonstrates decreases in self-report indicators of stress among various populations who receive a yoga intervention (Li & Goldsmith, 2012). For example, a study with people who have HIV and use crack cocaine found decreases in the Perceived Stress Scale compared with a control group. However, because there were low follow-up rates within the control group, the results may have been biased by unequal loss to follow-up rates across the yoga and control groups (Agarwal et al., 2015). Studies that utilize randomization in addition to an active control group generally find similar and sometimes greater decreases in self-reported stress among those people assigned to yoga as compared with the control group (Li & Goldsmith, 2012).



**A cognitive and behavioral perspective.** In addition to biological mechanisms, yoga may also impact cognition and behavior, as suggested by Uebelacker et al. (2010) who described ways in which yoga may impact depression. Yoga cultivates mindfulness, which involves non-judgmental attention to the present. Drawing one's attention to breath and physical movement in a yoga class can distract one from negative thoughts or stressors (Uebelacker et al., 2010). In cultivating mindfulness, one not only relaxes and restores the body in that moment, but also gains clarity in how to respond to life challenges (Kabat-Zinn, 1990). In addition, in order to release tension, one has to be aware of its existence. Yoga can build such body awareness so that one is better able to address areas of tension and pain (Kabat-Zinn, 1990). Yoga postures are designed to stretch and strengthen the body. Therefore, yoga not only builds awareness of areas of bodily tension (Kabat-Zinn, 1990), it also provides a remedy for that tension through the physical postures (Bonadies, 2004).

Secondly, the ethical and moral standards taught in yoga practice may help change the content of one's thoughts to promote positive thinking, such as self efficacy, self acceptance and the cultivation of a sense of life meaning (Uebelacker et al., 2010). Yoga philosophy, in particular yama and niyama (see Appendix A) provide guiding principles that could engender these positive thoughts. Having positive thoughts may help a person better manage stressful situations and solve problems (Uebelacker et al., 2010).

Thirdly, the practice of yoga may be experienced as enjoyable and provide a sense of accomplishment to practitioners, so that yoga practice may replace other less constructive stress coping activities (Uebelacker et al., 2010). Additionally, practicing yoga in a group format may provide a form of social support (Innes et al., 2005). With

social support, a person's mood may improve so that they are better able to cope with stressors.

### **Yoga's Effect on Substance Use**

While there has been extensive research on the effects of yoga on stress, there is limited research on the effects of yoga on substance use. In practice however, yoga is sometimes a complementary intervention offered within substance use treatment facilities (de Miranda, 2016; Lohman, 1999). In addition, Yoga of 12 Step Recovery combines both the group format of 12-step groups and yoga (Y12SR, n.d.).

Although limited, the research related to yoga and substance use does point to yoga's potential to positively impact substance use. In one randomized controlled trial, with a sample of 61 people in methadone maintenance treatment, hatha yoga and group psychotherapy were both associated with reductions in reported drug use and criminal justice activity (Shaffer, LaSalvia, & Stein, 1997). Some people in the yoga group reported that yoga was instrumental to their recovery, specifically citing an improvement in physical well-being and the value of breathing skills to relieve anxiety. A pilot residential treatment program in which yoga was the primary intervention conducted in Punjab, India found that participants experienced significant improvements in behaviors that support recovery and a non-significant decrease in stress. However, there was no control group used in this study (Khalsa, Khalsa, Khalsa, & Khalsa, 2008). A more recent study examined the effect of a 12-week yoga program for women who smoke cigarettes (Bock et al., 2012). The women participated in yoga along with cognitive behavioral therapy and were compared with women who participated in cognitive behavioral therapy and a wellness group. Women in the yoga group had less cigarette use

at the close of the intervention. The authors posit that the decrease in cigarette use among people in the yoga group was related to improvements in stress levels. While very limited, this research points to the potential for yoga to impact substance use and to do so by way of improving stress levels and mood.

While yoga's effect on substance use is not well researched, a systematic review finds that the closely-related practice of mindfulness meditation has been successful in decreasing substance use (Chiesa & Serretti, 2014). Yoga and mindfulness meditation are similar practices, both cultivating non-judgmental acceptance of the mind, body and environment. However, Hatha yoga incorporates more physical postures and breathing to elicit a greater relaxation and meditative response. Mindfulness interventions focus on breathing and meditation, with less focus on yoga postures. Some mindfulness interventions do teach a small number of yoga postures. Mindfulness stress-reduction curricula incorporate hatha yoga in each class (Kabat-Zinn, 1990). Mindfulness-based relapse prevention devotes one of eight sessions to yoga practice (Bowen, Chawla, & Marlatt, 2011).

While mindfulness studies have seen successful results among people who have completed intensive outpatient or inpatient treatment, there is evidence to suggest that mindfulness meditation interventions have content-related constraints that would impede success for returning citizens. First, people in residential treatment did not experience statistically significant improvements from mindfulness (Alterman, Koppenhaver, Mulholland, Ladden, & Baime, 2004). People experiencing more severe addiction related symptoms have lower consistency with meditation practice; experience less improvement in mood, withdrawal and coping symptoms; and report that meditation is difficult due to

having too much on one's mind (Chen, Comerford, Shinnick, & Ziedonis, 2010). Second, while participants have reported high satisfaction with mindfulness interventions, they have noted that meditation courses could be improved by incorporating more yoga (Vallejo & Amaro, 2009; Zgierska et al., 2008). Third, providers have expressed concern regarding the soporific effects of addiction treatment medications that may cause sleep with closing one's eyes, as in meditation (Vallejo & Amaro, 2009). Finally, for people who have difficulty with concentration and experience acute negative thoughts, as with people who have depression, mindfulness interventions may be inaccessible (Uebelacker et al., 2010).

The proposed yoga intervention addresses the above limitations of mindfulness by focusing on physical as opposed to mental processes. In the proposed study, participants will be at varying stages of their recovery process, and having been recently released from prison, they will likely be experiencing considerable stress. Yoga studies have shown a large effect in stress reduction among distressed populations (Michalsen et al, 2012). It is hypothesized that yoga is a more accessible relaxation technique than mindfulness for people under acute stress, with its emphasis on physical postures and breathing as opposed to a focus on relaxing the mind.

### **Yoga's Effect on HIV Medication Adherence**

While there is limited research looking at yoga and substance use, there is none that I identified that looks at the effect of yoga on HIV medication adherence. One small study found that after participation in yoga, people with HIV experienced decreases in anxiety in 44% of the sessions and decreases in pain in 53% of the sessions. In addition, participants used 35% less pain medications while participating in the yoga intervention

(Bonadies, 2004). In another study with people with HIV and cardiovascular disease risk factors, those participants in a yoga intervention experienced greater decreases in blood pressure than people who received standard treatment (Cade et al., 2010). Yoga therefore appears to be an acceptable and beneficial intervention for people with HIV, but it is unknown whether yoga affects HIV medication adherence.

### **Research Significance**

Research supports the assertion that yoga practice is an acceptable complementary treatment for stress. However, limitations in the methodological rigor of previous research prevent recommending yoga as an acceptable stand-alone treatment for stress. The present study builds on this literature by implementing a randomized controlled trial examining how yoga affects a sample that is under acute stress, returning citizens. While there is initial evidence that yoga may contribute to reduced substance use, there is minimal research support. This study contributes to a necessary foundation of evidence regarding yoga's effect on substance use. Finally, this study is one of the first to look at the impact of yoga on ART medication adherence. By adding a qualitative component, the study facilitates greater understanding regarding any mechanisms behind yoga's effects on stress, substance use and ART medication adherence. In addition, the qualitative interviews shed light on the acceptability and feasibility of yoga with a sample that does not have easy access to yoga classes, returning citizens with limited socioeconomic means.

## **CHAPTER 3**

### **METHODOLOGY**

#### **Participants & Setting**

The Institutional Review Boards of the University of Pennsylvania and Philadelphia FIGHT approved this study. Participants were enrolled from the Institute for Community Justice (ICJ), a re-entry service provider in Philadelphia, PA. ICJ is part of Philadelphia FIGHT (FIGHT), a comprehensive HIV/AIDS service organization providing primary care, case management, consumer education, advocacy and research on potential treatments and vaccines. One of the case management services that ICJ and FIGHT provide assist returning citizens with HIV. Among clients who are returning citizens, about 80% are returning to the community from the Philadelphia Prison System (jail) and about 20% are returning from the Pennsylvania Department of Corrections (prison). The Philadelphia Prison System houses people who are detained or sentenced for two years or less, and the Pennsylvania Department of Corrections houses people sentenced for more than two years.

The sample size calculations for this study were based on an effect size of  $d = .85$  obtained in a study utilizing a similar yoga intervention and the same stress outcome measure (Perceived Stress Scale) with distressed women (Michalsen et al., 2012). Power for this study was set at .80 ( $\beta = .20$ ). To find the estimated effect size of .85 between yoga and TAU with a power of 80% ( $\alpha = 5\%$ ) for a two-tailed test, a sample size of 46 (23 per group) was calculated using Cohen's (1998) power table (Cohen, 1988).

However, the target sample size was set at 80 because of an anticipated 30 % loss to follow up rate and low yoga class attendance rates.

Participants for this study were recruited through case management referrals and by self-referral (study posters were posted at ICJ and FIGHT facilities). A person was eligible if they were over the age of 18, spoke English, were a ICJ/ FIGHT client, had HIV, had a likely substance use disorder currently or in the year prior to their most recent incarceration as determined by the Texas Christian University Drug Screen II (Institute of Behavioral Research, 2007), had been released from prison or jail in the previous 12 months, had verbally agreed to the screening assessments and had provided written informed consent prior to the baseline assessments.

One hundred and eighteen people expressed interest in the study. Reasons for not enrolling included if a person was unable to contact after initial interest (N=17), was in reentry from prison/ jail for over a year (N=11), did not have problematic substance use (N=6), had scheduling conflicts with yoga classes (N=4), did not have a history of incarceration (N=2), was not a ICJ/ FIGHT client (N=2), was not interested in yoga (N=1), and did not have HIV (N=1). Seventy-five people were enrolled in the study. One person withdrew from the study after attending one yoga class because he found the class boring and experienced pain from a bullet lodged in his back. Two people were withdrawn from the study because they did not have HIV.

### **Treatment Conditions**

**Treatment as usual (TAU).** Participants used ICJ/ FIGHT services, including case management services, recreational or GED classes, and had access to the computer

lab. In addition, clients could receive free healthcare through the Jonathan Lax treatment center.

**Yoga intervention (Yoga).** In addition to receiving the same services as TAU, those in yoga received a 12-session weekly Hatha yoga intervention. There were four different cohorts so that the minimum class size was eight people. Each yoga class was 90-minutes long and was guided by a curriculum developed for this study (Appendix B), which included discussion of yogic philosophy, breathing exercises (pranayama), physical postures (asanas) and meditation (dhyana). The yoga intervention followed the Hatha tradition with a focus on physical movements. Each class also referred to Patanjali's sutras (the seminal yoga text) which introduces the central concepts in yoga philosophy. However, the main focus of the classes was physical movement, consistent with current trends in yoga practice in the U.S.

At week four and week eight, participants were given a handout regarding yoga poses and meditations to try at home (Appendices C and D). Classes were conducted at ICJ during hours in which drop-in services were not open in order to protect the privacy of study participants and reduce the possibility of non-study participants joining the classes. The first cohort had classes on Wednesday nights from 6-7:30 PM. The second, third and fourth cohorts had classes on Mondays from 12-1:30 PM.

There were two yoga instructors. A 30-year old woman with nine years of regular yoga practice and six years of teaching Vinyasa and Yin yoga taught the first cohort. In addition to teaching yoga, she worked in a public health capacity in the Philadelphia Prison System. The second, third and fourth cohorts were taught by a 29-year old man who is the co-owner of the Yoga and Movement Sanctuary in Philadelphia. He has been



practicing yoga regularly for 12 years, and has taught Vinyasa, restorative and therapeutic yoga for six years. Instructors provided written and verbal feedback after each class regarding the instruction and their adherence to the curriculum.

### **Randomization Procedures**

Participants were randomized to TAU or yoga at four recruitment periods utilizing a computerized random number generator, found at Random.org. Each of the four recruitment periods were 3.5 months apart and lasted three weeks, which ensured that there were sufficient people to enroll at any one time to constitute a yoga class size of at least eight people. In addition, randomization was stratified to ensure that there were an equal number of people from the Department of Corrections and the Philadelphia Prison Systems in both TAU and yoga.

### **Assessments**

Baseline assessments were conducted after potential participants completed a screening process which included a verbal informed consent, confirmation of eligibility criteria, and administration of the Texas Christian University Drug Screen II (Institute of Behavioral Research, 2007) to establish a likely substance use problem in the previous 12 months or the 12 months prior to their incarceration. The follow-up assessments were completed after completion of the yoga intervention, approximately three months post-baseline (program completion). All baseline and program completion assessments were completed at ICJ. In addition, at one and two month substance use assessments were completed over the phone or at ICJ. Participants were paid \$35 for completing the baseline assessment. Participants were paid \$40 for completing the program completion

assessment, with an additional \$10 if both the one and two-month substance use assessments were completed. A research assistant, who was also a staff member at ICJ, and the Principal Investigator completed the baseline, one, two and program completion assessments.

### **Baseline/ Program Completion Measures**

The following measures were assessed at baseline and at program completion.

**Stress.** The Perceived Stress Scale measured the degree to which life experiences were perceived as stressful. This scale has demonstrated strong test-retest reliability and predictive validity with study samples of community-based smoking cessation participants and college students (Cohen, Kamarck, & Mermelstein, 1983).

**Substance use.** The Time Line Follow Back assessed the frequency and type of drug and alcohol use, not including cigarettes, (Sobell & Sobell, 1992) at baseline in the 90 days prior to baseline and the 90 days prior to incarceration. At program completion, the Time Line Follow Back assessed substance use in the 28 days prior to the date of the last yoga class of the study. In addition to the baseline and program completion assessments, participants were called at approximately one-month post-baseline (after four yoga classes were completed) and approximately two months post-baseline (after eight yoga classes were completed) in order to administer the Time Line Follow Back to assess substance use in the previous month. These additional calls aimed to decrease attrition by maintaining contact with all participants throughout the three months of the study. In addition, more frequent administration of the Time Line Follow Back was meant to improve recall of substance use by participants. These time periods varied for the four yoga groups because there were holidays that caused interruptions in the weekly

intervention. Because of this variation, days of substance use were operationalized as a percentage of days of substance use within the follow-up period. Time Line Follow Back test-retest reliability of .80 or greater has been demonstrated in studies with drug users. Regarding validity, Time Line Follow Back reports of days of cocaine use have been highly correlated with percentage of urine screens positive for cocaine over a six-month period (Ehrman & Robbins, 1994; Fals-Stewart, O'Farrell, Freitas, McFarlin, & Rutigliano, 2000).

**ART medication adherence.** ART medication adherence was assessed through prescription refill information, a validated approach (Grossberg & Gross, 2007; Grossberg, Zhang, & Gross, 2004). ART prescription refill data were collected at baseline (90 days prior) and at program completion (between baseline and the date of the final yoga class) for days when a person was not incarcerated. For example, if at baseline, a person had been released from prison 30 days prior, then the percentage of ART pills prescribed in the previous 30 days was considered. If at program completion a person had been incarcerated for 15 of the prior days between baseline and program completion, then the percentage of ART pills prescribed in the previous 75 days was considered. For each interval, medication adherence was computed by the following formula: the numerator consisted of the number of days of prescribed doses and the denominator consisted of the number of days between first fill and last fill of the defined interval. The formula is as follows:  $(\text{pills prescribed per day} / \text{days between refills}) \times 100\%$  (Grossberg et al., 2004). For example, if a participant obtained three refills of 30 days supply over a 90 day period, his/her adherence was calculated as  $90 \text{ days supply} / 90 \text{ days} = 100\%$  adherence.

**Viral load.** Viral load was assessed through a blood test completed at the Jonathan Lax treatment center. An undetectable load was considered <50 copies of the virus (Corkery & Alcorn, 2012). For this study, viral load was considered dichotomous, either detectable or undetectable. In addition, viral load changes of one log or greater from baseline to program completion were reported because this change is considered clinically relevant (Dehovitz et al., 2000). Viral load changes are typically quantified on a log base 10 scale because changes tend to be very large (Corkery & Alcorn, 2012).

**Blood pressure and heart rate.** A sphygmomanometer was used to measure heart rate and blood pressure. Two readings were taken from each arm at baseline and at program completion. The readings were averaged together at baseline and at program completion, respectively (Carlson et al., 2007).

**Background information.** A study-designed questionnaire asked questions about demographics (age, race/ethnicity, marital status, etc.), current or prior involvement in yoga, involvement in substance use treatment, previous criminal justice involvement and duration of living with HIV.

**Qualitative interviews.** To learn about participants' experiences with and perceptions of yoga, a Research Assistant and the Principal Investigator conducted qualitative interviews at program completion. The interviews assessed participant satisfaction with yoga classes and perceptions of yoga among yoga participants (Appendix E). (These interviews also asked participants in both TAU and yoga about their experiences with stress and substance use in reentry, but those findings are not presented in this dissertation.) Semi-structured interviews contained specific questions

and themes to discuss, but also allowed for new themes to emerge that were not captured by assessments or pre-set questions.

### **Mixed Methods Justification**

This study employed a mixed methods approach for the purposes of complementarity (the qualitative findings to expand upon the quantitative findings) (Greene, Caracelli, & Graham, 1989). A QUAN+QUAL format (Morse, 1991) was employed, meaning that the quantitative and qualitative data were collected simultaneously at the three-month follow-up visit and that the quantitative and qualitative sections were given equal weight in importance. The quantitative outcomes chosen were driven by Sinha's (2008) model that illustrates how ways in which efforts to manage stress can impact substance use. The qualitative questions were designed so as to understand participants' overall experience with yoga and how yoga may support reductions in stress and substance use. However, the qualitative questions were open ended and designed not to lead participants to endorse that yoga supported stress or substance use reductions. The qualitative and quantitative findings of this study were combined at the data interpretation phase. The Results section presents the qualitative and quantitative findings separately. The Discussion section integrates the qualitative and quantitative findings.

## **CHAPTER 4**

### **QUANTITATIVE DATA ANALYSES**

Baseline differences in demographics, substance use, criminal justice involvement and HIV history between the yoga and TAU groups were evaluated with one-way ANOVAs for continuous measures and chi-square tests for categorical measures.

Descriptive statistics, including counts, percentages and chi square tests described the viral load status and viral load changes of study participants from baseline to program completion. Because most participants' viral load remained unchanged from baseline to program completion, inferential statistics were not warranted.

To assess the dependent variables for normality the following were considered: 1) the likeness of the histogram of its residuals to the normal curve; 2) the kurtosis and skewness values; and 3) the Kolmogorov-Smirnov test statistic. Because these assessments can yield different results, each was considered in the determination of normality.

Analysis of Covariance (ANCOVA; SAS PROC GLM) compared the yoga and TAU groups on the following dependent variables at program completion using intent to treat analyses:

- stress (score from the Perceived Stress Scale, continuous variable range of 0-40);
- medication adherence (percentage of ART pills prescribed in the previous 90 days of non-incarceration, continuous variable range of 0-100);
- heart rate (beats per minute, continuous variable range of 40-120);
- systolic blood pressure (mm Hg, continuous variable range of 90-200); and

- diastolic blood pressure (mm Hg, continuous variable range of 40-110);

Covariates included:

- the baseline value of the respective dependent measure.

Generalized estimating equations (GEE; SAS PROC GENMOD) compared the yoga and TAU groups on the dependent variable of percentage of days of drug use at one, two and three months in intent-to-treat analyses. The independent variables were:

- percentage of days of drug use within the previous 90 days of the baseline assessment (continuous variable range of 0-100)
- month (categorical variable including 1, 2, 3)
- treatment x month interactions (yoga x 1, 2, or 3; TAU x 1, 2, or 3) in order to control for the effect of time on treatment.

GEE was used because it takes into account the dependency of variables in repeated measure designs (Ghisletta & Spini, 2004). In other words, a naïve linear regression assumes that the present data set has 216 independent observations (72 participants x 3 time points; Sainani, n.d.). GEE, on the other hand, assumes that there are 72 clusters of data and within each of these 72 clusters there are 3 dependent observations. The benefit of taking into account dependency is that an unbiased estimate of standard errors is calculated (Ghisletta & Spini, 2004). GEE takes dependency into account by specifying a within-subject correlation structure, which then functions as a covariate in the analysis (Sainani, n.d.). For this study, an ‘exchangeable’ correlation structure was specified, assuming constant time dependency. Another benefit of GEE is that it uses all available pairs of data for a person, such that only missing observations are lost (Sainani, n.d.).

For ANCOVA and GEE analyses that were statistically significant or trending towards statistical significance, Cohen's *d* effect size was calculated by dividing the dependent variable mean difference between the yoga and the TAU groups by the pooled standard deviation of the dependent variable at baseline. Mean difference scores were computed by subtracting the mean estimated change of the dependent variable from baseline to each follow-up point (one, two, or three months) for the yoga and TAU groups (Friedman, 2008). The dependent variable mean values used to generate the effect size were the predicted values from the regression analyses for each variable (i.e., not the actual mean value).

To assess whether the number of yoga classes attended explained the variance in substance use and stress outcomes within the yoga group, multiple linear regression analyses (SAS PROC GLM) were used, controlling for demographic and baseline variables.

Dependent variables included:

- stress (score from the Perceived Stress Scale, continuous variable range of 0-40); and
- percentage of days of drug use at one, two and three months (continuous variable range of 0-100).

Independent variables included:

- number of yoga classes attended (continuous variable range of 0-12);
- the baseline value of the dependent variable;
- incarceration during the course of the intervention (binary variable including Y/N), which may be associated with decreased substance use (Dolan et al.,



2015), and increased stress due to the disruptive nature of incarceration (Western et al., 2015).

- active substance use treatment at the baseline assessment (binary variable including Y/N), which may be associated with decreased substance use and decreased stress (McGovern et al., 2009).
- age (continuous variable range of 24-60), years of education (continuous variable range of 1-20); and income (continuous variable range of 0-100,000), which were included because they can predict further substance use and criminal justice involvement (Gendreau, Little, & Goggin, 1996; Walton, Blow, Bingham, & Chermack, 2003).

## **CHAPTER 5**

### **QUALITATIVE DATA ANALYSIS**

The methodological approach for the qualitative component of this study is qualitative descriptive, with the goal of describing participants' experiences with yoga, in a manner that stays consistent with the descriptions provided by participants in the qualitative interviews (Sandelowski, 2000). Thematic analysis, a methodology to find and name themes in qualitative data (Braun & Clarke, 2006), was the technique used to analyze the transcribed interviews in order to answer the study's research question: How is the yoga intervention received among those study participants randomized to the yoga intervention?. This analytic method was chosen because it is not based on any particular theoretical framework, but provides methodological structure (Braun & Clarke, 2006). Transcriptions followed a denaturalized approach, meaning transcriptions did not convey accents, instead focusing on the accuracy of the substance of the conversation (Oliver, Serovich, & Mason, 2005). For example if a participant pronounced "something" without the "g" at the end, it was transcribed as "something." A denaturalized approach was chosen so that participants were not depicted in an insensitive way (Oliver et al., 2005). Three coders (including the PI) were randomly assigned interviews to code using NVivo software. Two of the coders were Research Assistants who had had experience coding one prior qualitative study. The PI was a doctoral student who had experience coding several prior qualitative studies. Before beginning analysis, the coders considered and discussed their familiarity with the study population and with yoga. This exercise was done to familiarize each coder with each other's knowledge of this population, to have a

better understanding of potential divergent codes that might arise, and to be aware of personal biases and preconceived notions. This study followed the six iterative phases of thematic analysis (Clarke & Braun, 2014) described below.

1. Familiarize self with the data: After the research assistant and I completed each interview, we wrote down initial thoughts about key findings from the interviews and discussed these observations. In addition, I read the transcribed interviews and listened to interviews when transcription was unclear. I wrote down initial observations and ideas describing how the data answer the research questions.
2. Compile a list of codes and the associated data that pertains to each code. I created a list of inductive codes based on the interview questions and initial readings of the data. I discussed these codes with the other two coders throughout the transcription process and we added codes that came up in reading through the transcripts.
3. Create a list of themes. I created a list of themes and went through the coded transcripts to find representative quotes that best represented those themes. A theme classifies a meaning that is found throughout the data and answers the research question.
4. Review promising themes and create a final list of themes. I checked that the themes corresponded to coded data by re-reading the interviews.
5. Name and define themes. The themes are defined in the Qualitative Results section.
6. Report findings.

## CHAPTER 6

### QUANTITATIVE DATA FINDINGS

#### Comparison of Treatment Conditions at Baseline

Participants in the yoga and TAU groups shared similar demographics (Table 1). Participants were mostly male (68%), African American (78%), and single (86%); they had an average age of 45 years ( $SD=10$ ) and were either unemployed (47%) or received disability support (47%). In regards to criminal justice history, 82% of participants had most recently been incarcerated in a jail and the average duration of the incarceration was about a year ( $SD=2.5$ ). On average participants had been incarcerated for a total of eight years in their lifetime ( $SD=8$ ). In regards to substance use, the most problematic drug was crack (40%), followed by heroin (21%). About half of the participants were in substance use treatment at baseline, predominantly intensive outpatient programs (57%). In the 90 days prior to the baseline interview, participants had used alcohol or drugs on about 23 of those days ( $SD=26$ ). In the 90 days prior to their most recent incarceration, participants had used alcohol or drugs on about 56 of those days ( $SD=35$ ). Participants had been diagnosed with HIV for an average of 14 years ( $SD=8$ ) and almost all participants reported that they were currently taking ART medications (96%). Only three participants self-reported that they were not taking ART medications, all of whom were in the yoga group; this difference neared statistical significance ( $p<0.08$ ). Prescription refill data indicated that participants were refilling their prescriptions 74% of the time ( $SD=42$ ) in the previous 90 days to baseline in which they were not incarcerated. Most participants (78%) also reported being prescribed ART when incarcerated, and were directly observed

(75%) when taking medications while incarcerated. In regards to yoga practice, most people (93%) had no to minimal prior experience with yoga.

*Baseline Characteristics of People Randomized to Yoga versus TAU*

	Yoga (n = 36)		TAU (n = 36)	
Gender, n (%)				
Male	28	(77.78)	21	(58.33)
Female	7	(19.44)	14	(38.89)
Transgender	1	(2.78)	1	(2.78)
Race/Ethnicity, n (%)				
Black	30	(83.33)	26	(72.22)
White	2	(5.56)	4	(11.11)
Black+White/Latino/Native American	2	(5.56)	4	(11.11)
Latino	2	(5.56)	2	(5.56)
Age, M (SD)	43.81	(10.27)	45.61	(10.33)
Income, M (SD)	727.41	(913.89)	655.31	(589.99)
Education, M (SD)	12.18	(2.06)	10.97	(1.84)
Marital Status, n (%)				
Single	31	(86.11)	31	(86.11)
Married	2	(5.56)	3	(8.33)
Engaged/ committed relationship	3	(8.33)	2	(5.56)
Employment, n (%)				
Receive disability	15	(41.67)	19	(52.78)
Unemployed	18	(50.00)	16	(44.44)
Work	3	(8.33)	1	(2.78)
Correctional Facility, n (%)				
Jail	29	(80.56)	30	(83.33)
Prison	7	(19.44)	6	(16.67)
Days since release, M (SD)	176.33	(101.86)	145.64	(122.73)
Months last incarcerated, M (SD)	16.62	(35.60)	9.06	(23.75)
Years incarcerated, M (SD)	8.82	(8.08)	8.19	8.09

	Yoga		TAU	
Current drug treatment, n (%)				
Yes	19	(52.78)	18	(50.00)
No	17	(47.22)	18	(50.00)
Drug Treatment Type, n (%)				
Intensive outpatient	10	(52.63)	11	(61.11)
Methadone/ suboxone	3	(15.79)	2	(11.11)
Inpatient/ recovery house	1	(5.26)	3	(16.67)
Outpatient	2	(10.53)	2	(11.11)
NA/AA	3	(15.79)	0	(0.00)
Most problematic drug, n (%)				
Crack	15	(41.67)	14	(38.89)
Heroin	7	(19.44)	8	(22.22)
Alcohol	6	(16.67)	5	(13.89)
Cocaine	5	(13.89)	5	(13.89)
Heroin & crack/cocaine	0	(0.00)	2	(5.56)
Marijuana & K2	0	(0.00)	1	(2.78)
Ecstasy	1	(2.78)	0	(0.00)
Crystal Meth	1	(2.78)	0	(0.00)
Heroin & xanax	0	(0.00)	1	(2.78)
Crack & alcohol	1	(2.78)	0	(0.00)
TCUDSII Score, M (SD)	7.50	(1.63)	7.36	(1.96)
Days substance use 90 days before incarceration, M (SD)	58.53	(35.58)	52.81	(34.51)
Days substance use in past 90 days, M (SD)	22.03	(26.37)	29.09	(32.96)
Total years (non-consecutive) not using drugs since initiation of drug use, M (SD)	5.54	(5.90)	6.73	(7.01)
	Yoga		TAU	

Years with HIV, M (SD)	15.92	(13.08)	13.08	(7.96)
ART prescription refills in previous 90 days (%)	68.80	(32.15)	79.09	(49.29)
Undetectable viral load, n (%)	25	(73.53)	22	(66.67)
Currently taking ART, N (%)				
Yes	33	(91.67)	36	(100.00)
No	3	(8.33)	0	(0.00)
Took ART when incarcerated, n (%)				
Yes	26	(72.22)	30	(83.33)
No	10	(27.78)	6	(16.67)
ART disbursement when incarcerated, n (%)				
Directly observed therapy	18	(69.23)	24	(80.00)
Keep on person	8	(30.77)	6	(20.00)
Previous yoga classes, n (%)				
None	23	(63.89)	26	(72.22)
1-5 classes	9	(25.00)	9	(25.00)
1-3 years (1-4 classes per month)	4	(11.11)	1	(2.78)
Perceived Stress Scale	18.39	(8.90)	21.81	(6.87)
Heart rate	75.42	(9.50)	78.50	(11.24)
Diastolic blood pressure	85.69	(12.18)	86.49	(12.44)
Systolic blood pressure	129.39	(12.26)	125.49	(18.07)

### Implementation of Yoga Intervention

The average number of yoga classes attended was 4.31 (SD=3.79). Twenty-two percent (n=8) of participants assigned to yoga attended zero classes, 33.33% (n=12) attended 1-4 classes, 25.00% (n=9) attended 5-8 classes, 19.44% (n=7) attended 9-12 classes. Reported reasons for non-attendance included incarceration (n [number of classes missed]=48), sickness (n=34), work (n=24), appointments such as medical or parole



(n=10), inpatient substance use treatment (n=8), lack of transportation (n=4), caring for a sick family member (n=3), overslept (n=2), forgot (n=1), and involvement in a fight (n=1).

### **Follow-up Rates**

TAU had a follow-up rate of 91% versus 81% of people in yoga at program completion. The reasons for loss to follow-up among TAU included incarceration (n=1), health complication (hospice care) (n=1) and death (n=1). The reasons for loss to follow-up among yoga included incarceration (n=2), health complication (surgery) (n=1), treatment program obligations (n=2), and unable to contact (n=2). In addition, during the course of the study three people from TAU and two people from yoga spent time in inpatient rehabilitation for substance use. Nine people from TAU and seven people from the yoga group spent time incarcerated.

### **Viral Load**

The yoga and TAU groups did not differ significantly in regards to the following viral load categories: undetectable at baseline and at month three, detectable at baseline and month three, undetectable at baseline and detectable at month three, detectable at baseline and undetectable at month three, undetectable at baseline and unknown at month three, detectable at baseline and unknown at month three, or unknown at both baseline and month three ( $X^2 = 8.21$ ,  $p > 0.22$ , Table 2). Of the people who had their viral load tested at baseline and month three, 83% (n=48) did not experience changes in their viral load status (Table 2). The reasons that a participant did not get a viral load test were that they were no longer a Jonathan Lax client or that they declined it. Within people in yoga,

four decreased by > 1 log. Within people in TAU, five decreased by > 1 log ( $X^2=0.01$ ,  $p<.94$ ). Within people in yoga, zero increased by > 1 log. Within people in TAU, three increased by > 1 log. ( $X^2=2.66$ ,  $p<.10$ ).

Table 2

*Counts and Percentages of Viral Load Status at Baseline and Month Three*

	Yoga (N=36)	TAU (N=36)
Undetectable at baseline & month three, n (%)	21 (58.30)	18 (50.00)
Detectable at baseline & month three, n (%)	2 (5.56)	7 (19.44)
Undetectable at baseline & detectable at month three, n (%)	0 (0.00)	2 (5.56)
Detectable at baseline & undetectable at month three, n (%)	4 (11.11)	4 (11.11)
Undetectable at baseline & unknown at month three, n (%)	3 (8.33)	3 (8.33)
Detectable at baseline & unknown at month three, n (%)	3 (8.33)	0 (0.00)
Unknown at baseline & month three, n (%)	3 (8.33)	2 (5.56)

### Stress

A histogram of the residuals of the Perceived Stress Scale scores shows a normal distribution. In addition, the skewness, kurtosis and Kolmogorov-Smirnov test p-value indicate a normal distribution (Table 3). The three-month stress score mean for people in TAU was 4.37 points higher than people in yoga, controlling for the baseline mean stress

score [ $F(1,59)=9.24, p=0<.05$ ]. The mean change difference between yoga and TAU represents a small effect size of 0.27 (Table 4).

### **Substance Use**

The histograms of the residuals of the percentage of days of drug use at month one, month two and month three reflect a relatively normal distribution. In addition, the respective kurtosis and skewness values were acceptable, albeit with a slight right skew. However, the Kolmogorov-Smirnov test statistic indicates a non-normal distribution. Based on visual inspection of the histogram, it does not appear that the degree of non-normality would interfere with using a parametric test such as GEE and specifying a normal distribution. However, to verify this visual inspection, I conducted GEE analysis specifying a Poisson distribution, a distribution which reflects a right skew (“The Poisson Distribution,” 2007). Because Poisson distributions require count data, I used the number of days of drug use within each time period. GEE analysis with a Poisson distribution did not yield different results than the GEE analysis with a normal distribution, verifying that the GEE with a normal distribution was accurate.

Treatment condition comparison on percentage of days of substance use was statistically significant [ $X^2(1)=11.47, p<.001$ ], with the GEE model estimating that those in TAU used drugs or alcohol on 41 % of days between baseline and program completion and participants in yoga used drugs or alcohol on 20 % of days between baseline and program completion. While substance use increased after baseline for participants in TAU, substance use decreased after baseline for participants in yoga (Figure 1). The least square mean percentage of days of substance use at one-month was 44.27% for people in TAU and 17.16% for people in yoga; at two-months was 47.52% for people in TAU and

20.34% for people in yoga; and at three-months was 31.01% for people in TAU and 20.27% for people in yoga. The estimated mean difference effect sizes between yoga and TAU in regards to percentage of days of substance use was medium from baseline to one month (Cohen's  $d$ : -0.70), medium from baseline to two months (Cohen's  $d$ : -0.64), and small from baseline to three months (Cohen's  $d$ : -0.16; Table 5).

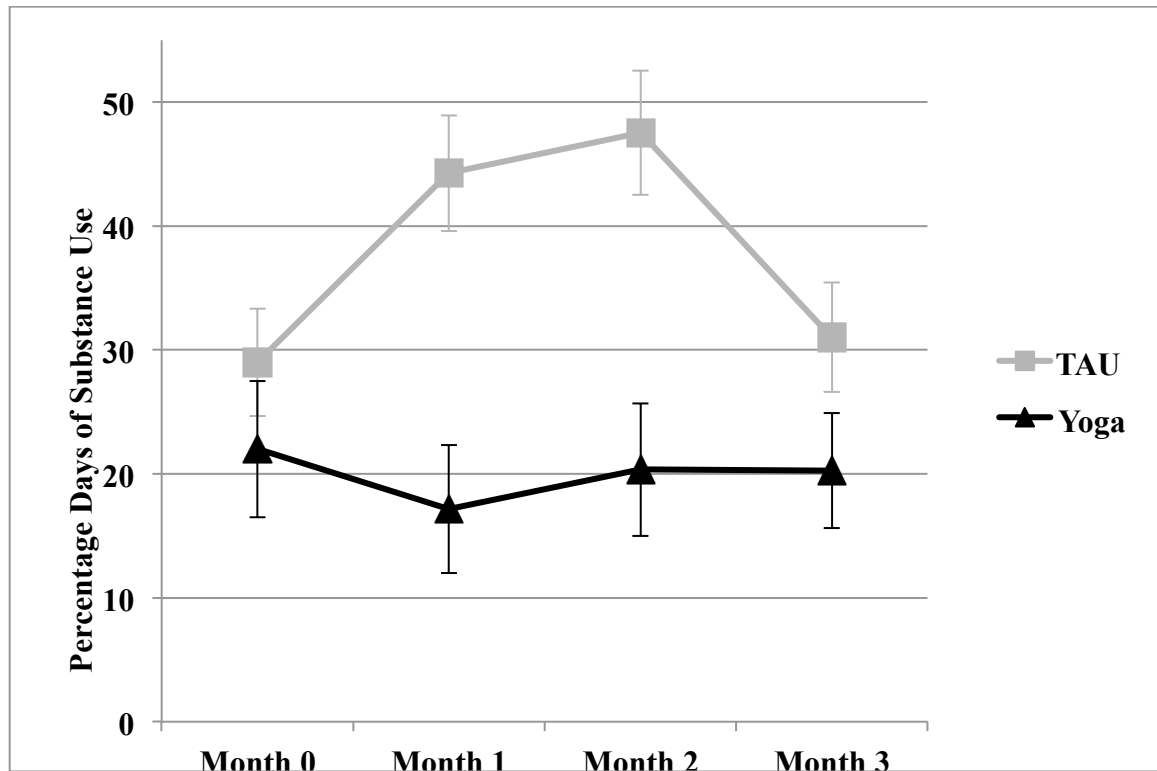


Figure 1. *Percentage days of substance use by treatment condition and month.*<sup>1</sup>

People in the yoga group experienced less percentage of days using substances after baseline ( $p < .001$ ), controlling for baseline substance use and the interaction of time by treatment condition. Error bars represent standard error. At baseline, scores represent 36 people from yoga and 36 people from TAU. At month one, scores represent 31 people

<sup>1</sup> Baseline= Previous 90 days. Month 1=Previous 22 days. Month 2=Previous 28-35 days. Month 3=Previous 28 days

from yoga and 34 people from TAU. At month two, scores represent 28 people from yoga and 32 people from TAU. At month three, scores represent 29 people from yoga and 33 people from TAU.

### **ART Medication Adherence, Heart Rate, and Blood Pressure**

The histogram of the residuals of heart rate, diastolic and systolic blood pressure, skewness and kurtosis values and Kolmogorov-Smirnov test p-values all reflect a normal distribution (Table 3). While the Kolmogorov-Smirnov test p-value of ART medication adherence was 0.01 (indicating non-normality), the skewness and kurtosis values were low and the histogram reflected normality. At program completion, each of these measures was not significantly different between yoga and TAU, controlling for the respective baseline variable (Table 4). While not statistically significant, ART medication adherence decreased for those in TAU to 69.63% and increased for those in yoga to 79.99% (Table 4). The estimated mean difference effect size between yoga and TAU in regards to ART prescription refill use was medium from baseline to three months (Cohen's  $d$ : 0.49). However, because this relationship was not statistically significant, it may be that this effect size was due to random chance.

Table 3

*Normality Tests for Dependent Variables*

Measure	Time point	Skewness <sup>2</sup>	Kurtosis <sup>3</sup>	Kolmogorov Smirnov test p-value <sup>4</sup>
Perceived Stress Scale	Month three	0.08	-0.46	0.15
% of days of substance use	Month one	1.21	1.86	0.01
% of days of substance use	Month two	1.24	1.57	0.01
% of days of substance use	Month three	0.47	0.74	0.01
Medication adherence	Month three	-0.75	-0.16	0.01
Heart rate	Month three	0.15	1.77	0.15
Diastolic blood pressure	Month three	0.37	0.03	0.15
Systolic blood pressure	Month three	0.88	0.88	0.14

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<sup>2</sup> Values for asymmetry between -2 and +2 are considered within the range of a normal univariate distribution (George & Mallery, 2010)

<sup>3</sup> Values of kurtosis between -2 and +2 are considered within the range of a normal univariate distribution (George & Mallery, 2010)

<sup>4</sup> P-values greater than 0.05, indicate that we cannot reject that the distribution of the measures residuals are normally distributed.

Table 4

*Three Month Mean Values for Blood Pressure and ART Medication Adherence by Treatment Condition and Test Statistics from ANCOVA Analyses*

Measure	Baseline value for yoga; M(SD)	3 month value for yoga; M(SD)	Baseline value for TAU; M(SD)	3 month value for TAU; M(SD)	F-value	P-value
Systolic BP	129.39 (12.26)	130.55 (15.04)	125.49 (18.07)	126.32 (20.04)	0.07	0.79
Diastolic BP	85.69 (12.18)	87.88 (10.36)	86.49 (12.44)	87.71 (14.39)	0.00	0.98
Heart rate	75.42 (9.50)	80.57 (12.61)	78.50 (11.24)	78.92 (14.29)	0.69	0.41
ART prescription refill	68.80 (32.15)	79.99 (30.78)	79.09 (49.29)	69.63 (0.38)	0.36	0.55

Table 5

*Effect Sizes for Stress and Substance Use\**

Study Outcome	Yoga Group		Control Group		Corrected effect size $d_{corr}$
	Mean Change	Baseline SD	Mean Change	Baseline SD	
<b>Percentage days of substance use</b>					
Baseline to 1 month	-16.47	26.37	4.28	32.97	-0.70
Baseline to 2 months	-12.34		6.76		-0.64
Baseline to 3 months	-12.22		-7.51		0.16
<b>Perceived Stress Scale</b>					
Baseline to 3 months	-3.62	9.42	1.42	7.02	-0.27
<b>Medication Adherence</b>					
Baseline to 3 months	-13.24	32.15	7.30	49.29	0.49

\*The mean change values were generated from the predicted values from the regression analyses (which controlled for month, month x treatment condition, and baseline value).

Therefore, these values differ from the actual mean changes.

**Predictors of Stress**

Multiple linear regression analysis found that number of yoga classes attended, incarceration during the course of the intervention, active substance use treatment at the



baseline assessment, age, years of education, and income did not predict Perceived Stress Scale scores at three months.

### **Predictors of Substance Use**

Type of employment ( $p < .05$ ), and whether or not in substance use treatment at baseline ( $p < .05$ ) were significantly associated with percentage of days of substance use at three-months post-baseline. Being unemployed was associated with 24% more days of substance use than people who received disability while controlling for the other variables in the model. Being unemployed was associated with 40% more days of substance use than people who worked while controlling for the other variables in the model. Not being in substance use treatment at baseline was associated with 22% more days of substance use than people who were in substance use treatment at baseline, while controlling for the other variables in the model.

## CHAPTER 7

### QUALITATIVE FINDINGS

Participants assigned to yoga shared feedback regarding what they liked and disliked about the yoga classes, and described how classes affected them. Participants' reflections regarding their experiences with yoga were overwhelmingly positive. However, participants were also candid about some concerns. The following themes coalesced from thematic analysis of the qualitative interviews with 27 participants.

#### **Social Support**

Yoga classes provided social support that grew throughout the course of the intervention. One of the important components of this social support was the absence of judgment among classmates.

Being around with the different people. I love the energy that it brought. . . it wasn't like "oh, I don't like her," it wasn't none of that. . . we laugh, we have fun. And it wasn't stressful at all. It was easygoing.

Another participant commented:

It [finishing the yoga intervention] felt like I lost connections. Like I was in a class of people that didn't judge me, wasn't mean to me, wasn't angry at me. They were all smiling, laughing and giggling. I made them laugh. They made me laugh. . . I want to always hold onto that. . . It was—that's very rare for my life. That's very rare that I don't have not one person that just got to be the one to get on my damn nerves.

Another participant reflected that while he doesn't like the group dynamic in recovery meetings, he appreciated the group dynamic in the yoga classes: "Everybody's trying, you know, do their thing [in the yoga classes]. But not everybody trying to tell me how to do my thing [like in recovery meetings]."

A second important aspect of the social support was respect for and inspiration from classmates. For example, one participant said: "Everybody was into it. A lot of people in yoga class with me was- was determined. . . determined to build their, you know, to get all the yoga that was offered." Another participant commented:

There was a young lady in there and she was kind of overweight, but I seen her trying and struggling and that just did it for me. Like damn she's really trying . . .

It was encouraging to see – so . . . I have a good feeling when I left the class.

Another participant commented:

My classmates, they was in there for the same thing I wanted. That gave—that helped me a lot. . . that it wasn't people just for the money or just to get out of the cold. Or you know, it was people in need that wanted to get what yoga was offering. That was the favorite part, that I was with people that wanted the same thing I wanted.

### **An Unfamiliar Experience: Both a Strength and a Challenge of Classes**

Participants discussed having negative stereotypes regarding yoga that while not preventing them from joining the study, may have prevented them from trying yoga in other contexts. At the same time, yoga being a new and different practice was also one of its draws. Acceptance of yoga, despite being an unfamiliar practice, was key to benefitting from the class.

People held stereotypes about yoga being a practice for White women with socioeconomic resources, a stereotype that was affirmed by what they saw in the community. One participant described:

I was thinking yoga was a woman's thing. . . I hate to say it that way, you know what I mean, because so many more men are into it now. And after trying it, I want to explore it more because one thing I did find about it was it did give me some relaxation.

Several participants noted that while they would not try yoga in the community, they were open to trying it at Philadelphia FIGHT because “everybody, every shape, size comes here.” This participant further described seeing yoga classes offered during the summer time at one of the city parks in Philadelphia:

They did yoga in the park. I would have-not have been able to do it there- because it was just nothing but skinny, White women- some men. But they were all, like, of a certain class. You know what I mean? I don't think I would have been comfortable there. I mean they would have pretended like I was welcome, but it wasn't like this one [study classes].

Another participant described seeing a yoga studio near the drug treatment center he attended: “I only see White people in there [yoga studio]. So I didn't want to go in and look out of place. . . I don't never see no Black people go in there, so I was like – I'll do it here [Philadelphia FIGHT] though.” While yoga studios in the community felt unwelcoming based on class, race and gender, participants felt comfortable doing yoga at Philadelphia FIGHT where their classmates shared some similar life experiences.

Another stereotype about yoga classes was that it involved contorting one's body in uncomfortable ways. "Well I used to hear the word yoga, I thought I had to contort and get into these positions that's going to really make me uncomfortable."

One participant described how stereotypes about yoga affect how community service providers present it. She had attended a class called "stretch & breathe" that essentially was a yoga class, but was not called "yoga" because otherwise no one would attend the class. She went on to describe how prior to the study, she had negative connotations about "meditation." "Because when they used to say 'meditation,' I used to say, 'Well, I'm leaving. I'm not doing meditation.'"

Because of the unfamiliarity with and stereotypes of yoga, participants noted that it was important to open themselves up to yoga practices in order to reap the most benefits. One participant described: "It [yoga] was something different. I opened myself up to receive it. . . . It's not something that I would do. But I had the opportunity to give it a try. And it felt pretty good." Another participant said:

I feel there's a lot of negative associated with yoga. Thinking, oh, I can't do this, or I'm too fat, or I'm too stinky . . . Preconceived notions that don't even have anything to do with it – not being welcome, not being fit. I may smoke cigarettes and do all this, so I'm not- I know I'm not going to have energy to do yoga. Like, put all that aside. Go on ahead and do it.

### **Taking Care of One's Self**

Participants appreciated the yoga classes as a time to take care of one's self. One participant commented that taking time to care for one's physical body is often neglected, and this care is especially important for people who have HIV:

I think yoga is definitely a necessity especially for people that's HIV positive. . . once you know you're positive, it's always getting past the fact of knowing you're infected. We take care of our bodies more than the average person because we are positive. So we have to take those pills every day. We have to eat every day. We have to get up on time every day. Just like that and putting yoga into taking care of your body, yeah.

Additionally, participants described yoga as a chance “to get away” and focus on one’s self. One participant described that when she recently recovered from drug use, “I was just so run down, so I said this time around, once I get back up, I’m just all about me.”

### **Effects of Yoga Practice**

**Relaxation & stress reduction.** Yoga supported relaxation, restoring the body and mind. “It’s [yoga’s] like a good tool for relieving stress, taking your mind off things to build you back up more stronger.” One participant described a surge of energy that accompanied the relaxation: “I had energy. Like I was relaxed, but still pumped up.”

Other participants described a more calming effect:

I found it [yoga] very relaxing, very comforting. And it felt good to me after coming from work and being on my feet all day, I was able to relax and meditate and do something. Yoga was something that’s going to you know, connect me to my spirit in myself.

Another participant described:

If you’re stressed, if you’re worried about you know, money or something, or anything, your kids, your job, you know, just life period, it just relaxes you. He

[the instructor] just tell you, ‘Listen, clear your mind, don’t think about anything, just leave it, you know, where it was, at the door.’

Other factors that contributed to the relaxation experienced in yoga class included the tranquil atmosphere of the class, the calming voice of the instructor, and not being too crowded. “It’s good, um, mentally, if you can find somewhere nice and quiet to be [like the yoga class].”

On days when participants were feeling more stress, yoga helped reduce tension.

One participant describes:

I would come in the class under a whole lot of tension and stress and leave feeling good about myself . . . it [yoga] was hard at the beginning [of class]. At the end, you know, it was, I was all right. I was better.

Another participant describes that on difficult days:

Um—I sort of look forward to it [yoga]. Like, it was my escape away from everything. You know what I’m saying? And then—um—you know going through the classes and feeling relaxed and all, you know. Then when I leave here and I get outside and breathe that first breath of fresh air- it’s like, ‘Okay. Everything’s okay.’ Like, things ain’t so bad.

One participant, who only attended one class, described how he fell into a deep sleep after class.

It was weird because after I took the class, I went and slept for, like— two hours, and it was, like, a deep sleep. . . Yoga's relaxing. . . I was having a shitty day that day. And I just remember I took the class. Then I went right to sleep. It made

it all better. It helped clear my mind. Clear my mind, and it was a distraction—a pleasant distraction.

**Reduction of tension and pain.** Practicing yoga poses reduced physical pain and tension associated with daily living, such as sitting for long periods. “I can just feel the tension coming out, you know. . . It feels good.” One Muslim participant had never been able to maintain a sitting position for prayer until practicing yoga. Several participants noted that yoga reduced back pain.

I was always suffering from lower back pain. . . cramped muscles. When I wake up in the morning body aches and things of that nature. . . dealing with this yoga classes, you know, I find more of an inner peace. My body is more at one. I don’t suffer from the pains like I used to.

Reduction in muscular tension often came after some initial soreness and pain. With practice, however, the poses became easier as the muscles relaxed in the poses. “Since I been doing yoga, I been able to use a lot of muscles that I didn’t use in years, you know. At the beginning it was painful, but as I kept coming. . . it got easier.” Another participant describes that after practicing yoga she felt:

tired, and depending on how my body felt before, sometimes I felt a little sore.

You know things being stretched out or something like that. And then, at the same token, it felt like, whoa, like, I’m a little lighter.

**Feel good.** Participants described an overall sensation of feeling good after yoga practice. “It just makes me feel really good.” One participant described how this sensation intensified after more strenuous poses: “And some of those classes were more strenuous. And put more pressure on the limbs. But the after effects, just as strenuous as



the position was, these, this chemical release was much more intense.” One participant described the feeling that he gained from yoga as one of hopefulness that was a combined result of yoga practice and using less drugs. “Things are still not as good as they could be, but . . . I’m more hopeful. . . That’s a change I notice. . . I think it’s a combination of the yoga and using less.”

**Present focused.** Yoga practice helped participants stay present-focused as opposed to following their thoughts. “I wasn’t having racing thoughts, I was concentrating on the voice that I was hearing.” Another participant describes:

After I take the class I always felt focused. I always felt more um, here and now. . . after the class, it gave me the motivation to stay focused that whole day because I wasn’t thinking about anything other than being in the moment and staying there. So it centered me and balanced me and allowed me to focus on the right now at this moment.

One participant described how the breathing brought her attention to the present and away from thoughts about conflicts with her boyfriend. “Because like the breathing, it helps me. It helps clear everything. . . When I was doing yoga, like the stretching, even if I start thinking about what [boyfriend’s name] is doing, once I breathe in and out, it cleared my mind. Then it brought me back to what I, like, what I feel in my body.”

**Health improvements.** Yoga was associated with an overall feeling of well-being and health. “I know I did something for me that built my health up.” Other participants described alleviation of specific ailments such as arthritis, constipation and COPD. One participant described how she had struggled with constipation, but after practicing certain yoga postures daily, the constipation was alleviated. “Before I got here, and this is the

truth, before I got here, I was constipated. I was taking pills for constipation . . . [now] if I stretch every morning, I can stay regular.” Another participant described that yoga alleviated symptoms of COPD:

I got COPD, and it [yoga] teaches me how to, um—when my COPD starts to act up, how to slow it down until I get to my pump. I did this morning when I had, like kind of a little jog for the bus. So when I sat down, I couldn’t catch my breath. . . Then I calmed it down [with yoga breathing practices].

**Accomplishment.** Participants described feeling a sense of accomplishment in trying out and completing a new activity. “I felt like I had reached another milestone that I-I had accomplished something. That I had achieved something.” Another participant said: “I felt good. I felt like I’ve done grew up. Because, I’ve, I’m famous for starting stuff and don’t finish.”

### **Yoga’s Effect on Substance Use**

Some participants did not think that yoga practiced affected their substance use. As one participant said: “If you’re going to get high, you’re going to get high.” For others, yoga did support reduced substance use for the reasons described below:

**Complements recovery.** Yoga practice can complement the recovery experience. One participant noted that yoga helped him understand spiritual aspects of recovery, specifically helping him foster “self-love, self-respect, and self-confidence.” In particular, the breathing and centering helped him “get in touch with the fact that I’m a spiritual being.” Another participant describes yoga “just kept me in a recovery based thinking.”

**Provides a purpose.** Yoga classes could provide an alternative purpose to drug use. Knowing that yoga class was the following day, one participant described being

motivated to not use drugs the day before to ensure that he made it to class. In this way, yoga provided a routine that didn't involve drug use.

It [yoga] slowed it [drug use] down. I wasn't motivated to use. I was so motivated and focused on something else, that I didn't have time to think about using at all. So it worked, it helped me. You know, to stay focused and stay in that moment in that time, because I had priorities, I had that balance, and I had something to do. It's that routine, that structure, that, you know, purpose of you have something to do, you know.

**Confidence.** Yoga provided a feeling of self-worth and confidence in one's self. Having self-worth motivated participants to prioritize their health and recovery. One participant described how yoga provided her the self-confidence to not use drugs with her friend:

Yoga helped. And I—I believe if I didn't have the meditation and the counseling that yoga gave me, that she [my girlfriend] would still be coming in my door. If I didn't have that [ability] to be able to go inside myself and know how good I feel, and what yoga gave me, like 'you worth it.' I wouldn't have been—she would still be coming over. So yeah, it helped. It gave me enough confidence to say that it's [drugs] not more important than my self-worth or my health.

Another participant noted that “one hundred percent did” yoga contribute to his decision to stop using. He described how yoga supported him to feel good about himself:

Before I even signed up for this yoga class, before I even went, that was the last thing on my mind was to like stop [using drugs]. I-I just accepted the fact that, 'Okay, this is what it is. This was going to be. Okay. Deal with it.' But, when I

started going to the yoga classes and I really got into it, and, you know, I started feeling good about myself, you know what I'm saying? Which was a totally different feeling that I had not experienced in quite a long time. And—um—I-I really liked that feeling. I started looking in the mirror . . .

**Yoga class takes up idle time.** Yoga class took up time that otherwise might have been spent using drugs, “because like I said, the idle, the idle time is kind of, like, a problem with [relapse].” Another participant said yoga helped him use less “because for that hour and a half, I wasn't getting high.”

**Distraction.** Yoga practice “really took my mind off when to use.” One participant described how yoga helped him drink less because he practiced it when he had an urge to use drugs.

Because, I know yoga has, um, helped me lessen my alcohol intake. I know that much. It's like I would get in a pose that's real comfortable for me instead of walking to the liquor store and then I would kind of rock it out until I'm tired. . .

At nighttime I'll do it [yoga] instead of drinking.

Another participant described that yoga:

gets your mind off of the particular usage- you know what I mean? It relaxes your body. So, like you don't think about it no more. And then by the time you finish it [yoga], you don't want it [drugs]. You know what I mean? Like, you like, ‘Man, I feel so good and energized. I'm good.’

**Stress relief.** Some participants made a connection between reduced stress from yoga classes that then also supported them to use less drugs. One participant described how the stress relief benefits from yoga were preferable to drug use:

I like it [yoga] because . . . it's something different. But it really relaxes me. I mean, the weed, it relaxes me in a different way. You know it's like, this here [yoga] is for myself. For me. You know, for my brain, and everything. And it just- it feels really good, you know. I feel good about myself afterwards.

**Changes the experience of drug use.** One participant described that after attending one class, the experience of smoking a cigarette was unpleasant:

Um, after I did the yoga class, I had tried to smoke a cigarette. It was brutal. It was brutal. I noticed a difference about that. I just feel like yoga opened up a lot of—like, I was breathing really deep, I was really trying to do the class. And then, when I got out, it was just—my body was limber. And then I tried to smoke a cigarette, and it was the worst cigarette ever. . . I knew it [was] something to do with the yoga.

### **Preferred Yoga Activity**

Participants appreciated that each component of yoga practice (postures, meditation, breathing and philosophy) complemented each other. One participant described:

I had to get to the breathing exercises to get to the meditative level. Yeah, ease—relax me and soothe me. You have to get—intellectually you have to gear yourself towards it. You can't just put the cart before the horse with this one. And expect to go anywhere.

Participants also noted that they appreciated class discussion either based on the theme of the class or conversation that organically arose, as this made people feel more at ease in class.

While participants appreciated all the components of the yoga practice, some people favored a particular activity. On a whole, participants preferred the more meditative and relaxing positions. The most popular asana was savasana (corpse pose), when one lies supine and relaxes the body and mind at the end of class, after having exerted the body during the class.

The very last part, when they tell you to breathe and just lay there and let everything sleep, just, you know, everything is just gone, you just let go of everything, just relax yourself, relax your muscles, and just lay there and close your eyes and you be there for like ten minutes . . . that's the best part. Everybody enjoys it, it's just—you just lay there and just, and after all of the work, it's just so relaxing.

The most challenging asanas for participants were balancing poses. Participants appreciated doing more difficult poses because they felt challenged and a sense of accomplishment, especially when they noticed improvement.

Breathing exercises were particularly valued for their role in alleviating anxiety. It was a simple way to relax the body and mind.

The breathing techniques that, you know, he showed me, I utilize them in my personal life a lot for anxiety . . . for some reason breathing just gives the whole body . . . total relaxation—mentally, you're just in a different realm.

### **Yoga Instruction**

Participants were overwhelmingly positive about the yoga instruction and felt that the class pace was appropriate for people new to yoga. Several participants noted that the quality of the yoga instruction was what motivated them to continue coming to classes.

**Informative.** Participants appreciated learning the purpose of the poses, the effect of the poses on the body, and how to ensure that each pose had its maximum effect on the body. “They [the yoga instructors] explained the what’s, the where’s, the when’s, the how’s and more importantly the why’s.” At the same time, poses were explained in clear and direct language: “she broke it right down and made common sense.” One participant critiqued that sometimes the instructor would note you should be feeling a pose in one area of the body, but the participant actually felt the pose in another area of the body.

**Calm and patient.** Participants appreciated the soft, calm tone of the instructors. “He speaks in a muted town. . . It was definitely relaxing.” Participants noted that the instructor’s calm voice helped them to relax more in meditative poses such as savasana. The instructors were also described as patient, and taking their time. “I was like, ‘Damn, that’s the way I’d like to be.’ Like, seriously, like- even when the class was small he didn’t show the disappointment on his face-if he-if he was disappointed, he didn’t show it.”

**Modification of poses.** Instructors modified difficult poses. One participant described:

You know, like I’m 54-years old and I’ve done some damage to my body, especially at the joint level. And, when she would see we were having difficulty, she would facilitate us in such a way and she made it relatively easy.

Instructors also gave participants more relaxing poses (like child’s pose) if any pose was too difficult.

**Supportive.** Participants felt supported by the instructors. One participant described:

It's pretty cool when you sit there because he asks you about your day. So you have somebody to tell it to, and it's like, ok, well, even if—you know, it really doesn't matter what they think, but if you tell them, you have somebody to tell and maybe will feel a little bit better.

Instructor support was particularly appreciated when participants were trying difficult poses. The instructor highlighted the importance of trying, as opposed to actually doing the pose completely. Participants reported that the instructors struck a good balance between encouraging people to try a pose and exercise caution. “And she always said, ‘If there's something that you feel like your body is not allowing you to do, don't worry about it.’ She didn't, she didn't push us. She was very reasonable.” Another participant described: “The teacher was excellent. He was patient, he pushed you. . . You know, and he allowed me to move my body and take it places that I didn't want to take it, because I was so comfortable in doing my regular exercise.”

Participants appreciated individualized attention. For example, one participant with arthritis discussed how the instructor modified poses that were weight bearing on the hands. Another participant appreciated when the teacher noted progress that he had made by getting deeper into stretches. Several participants discussed how they appreciated when they saw the instructor giving other participants individual attention.

There was this one lady who was a little heavy set. And she couldn't do half the stuff we were doing. But he [yoga teacher] definitely- like, he would give her a chair, and she was still doing what we were doing, but it would just be her way of doing it. . . We were all different and we all had different levels of what we could do, and he would just made a way for us to all do the same thing.”



This participant then made a comparison to a yoga class that he had taken in the community.

He [yoga teacher in the study] had a good way of blending us together so we all felt like we were doing something. Instead of when I went to the other ones [yoga classes in the community], I'd be so tired and the poses, I'm like 'You're in this pose too long. Can we switch?'

One participant described how having a male teacher who was comfortable doing movements that he associated with femininity supported his own feminine side. "I appreciate the class. It's for gay men. It [the class] helped me be a little more comfortable with feminine sides."

### **Challenges with Yoga Practice**

The following themes describe participant critiques regarding the yoga classes.

**Infrequent classes.** While some participants expressed that a weekly class was sufficient, others noted that the positive effects experienced from yoga did not continue through the week. For example, one participant noted that the effects lasted until the next day, while another said that the effects only lasted through the class: "I would come in the class under a whole lot of tension and stress and leave feeling good about myself, at least till I got going . . . at least till I got back in the atmosphere."

**Class pacing.** In general participants liked the pace and format of the class. However, one participant found that the poses became repetitious. "After a while, it just felt like it was being dragged out." Additionally, the participant who had withdrawn from the study after having attended 20 minutes of one class expressed that the yoga was "too slow" for him and that he would be surprised if anyone his age (24 years old) enjoyed the

classes “unless they really wanted to do it.” There were also participants who would have preferred a longer relaxation period at the end of class or more relaxation poses throughout the class.

Some were confused by the instruction about breathing exercises. For example, several participants said that their breathing pattern was faster or slower than the cadence of the instructor. Sometimes participants felt “a little rushed or like you’re not breathing correctly” when the instructor counted out the inhalations and exhalations at a different rhythm than what was easy for the participant. “I was always off, so it made it harder.” Another participant also noted that his breathing pattern was different than the instructors’ counting, but that it did not bother him as he focused on his own breathing.

**Class timing.** The timing of the classes was not convenient for some participants. In the first wave, classes were held on Wednesdays at 6 PM. While one participant who worked said this was a good time so that he was able to attend after work, he and another participant noted that these classes could be difficult because they were fatigued after the day. In the three other waves of the intervention, the classes were held at noon on Mondays, which was a challenging day because often other appointments were scheduled for this day. One participant noted that this time was not ideal because he would have to forego his opportunity to get a free lunch through a homeless service provider: “So, I’m like eat or yoga? You know what I mean? That’s what I kept fighting with.” One participant said that any time commitment at all was difficult because he was participating in a treatment program and attending school so he felt overcommitted and fatigued.

**Difficulty with poses.** While participants liked being challenged by poses, at times the poses felt too difficult. One woman noted that in one class she was the only woman and the class participants were doing a pose that she did could not do: “I felt like I didn’t belong. So I felt kind of sad. I-I couldn’t do it, you know? That was the one time.”

**Distracting classmates.** Attendance patterns varied widely for participants and for participants who came consistently, it could be frustrating when other classmates were not as committed. Several participants noted that low attendance was disrespectful to the teacher, and one participant noted that it disrupted the energy of the class. However, another participant noted that he did not like the feeling of being obligated to do anything. He preferred the idea of going to activities (such as yoga) “if I feel like it. Not because I obligated myself to come.”

**Class size.** One participant did not like classes when more than five people attended, as he felt he did not get individualized attention. Another participant felt uncomfortable in classes when only a few people attended because “he felt bad for the instructor.”

### **Yoga Practice Outside of Class**

The most common yoga practices exercised outside of class were meditation and breathing techniques, which could quickly calm one’s self and were easy to do in any space. Several participants described using these techniques while on public transportation to reduce frustration. For example, one participant described breathing to keep his mind from worrying about all the things that he needed to get done when on the subway. He exercised some of his breathing exercises “and it kind of took my mind, like,

right off of it [things that needed to be done]. Like, I don't even remember when I stopped thinking about it, but I know I did.”

Another participant described how he used the breathing exercises that he learned to calm down before reacting with anger towards a houseguest with whom he felt annoyed. The participant described that he stopped, used his breathing exercises, deduced a plan to talk with the houseguest, and executed that plan, to which the houseguest reacted well. “So that way, meditation, the breathing, the thinking, and the planning did work, and it relieved the stress.”

Yoga was also something that could be incorporated in people's everyday schedules, as by not rushing and taking time to breathe and reflect or by practicing yoga postures while watching TV. One participant practiced daily in the morning to alleviate constipation. Another participant discussed the value of meditation at the end of the day to wind down.

Because I used to be on the move so much. So it's like now I just take time out. . . before I go to bed, I sit on the side of my bed, just think, be thinking. Like sum up my whole day, what I got accomplished.

Several participants noted that the handouts given out in class four and class eight helped them to practice the postures at home. Some participants said that they did not practice any of the yoga poses outside of the class for the following reasons: not enough space, not enough time, and too much on one's mind.

### **Barriers to Yoga Attendance**

Participants reported the following barriers to attendance:

**Drug use.** Using the day before or the day of yoga led to non-attendance. One participant described that recovery from drug use interfered with his attendance.

The weekends when I used, I wasn't able to come. Yeah, it was harder, because I'm tired, when I use, we use late at night. So it was harder for me to wake up and get up and focus and do what I had to do.

**Other commitments.** Participants noted that they had other appointments that they could not miss, such as court, parole, medical, substance use treatment, and school.

**Sickness.** Participants reported various health conditions that prevented them from attending yoga class, such as depression, side effects from ART medications, and a bone spur that caused hip pain and injury. One participant was in a coma for several weeks due to a bicycle accident. Several participants reported experiencing depression that prevented them from leaving the house. One participant described his depression in the following manner:

There's times when I'll get fully dressed and get to the front door, and then turn around and go right back up to my room and not leave the house. And, you know, it's hard to explain, and then when you do explain it, people don't understand it, you know it's like, that's where I feel safe.

**Caregiving.** Some participants discussed providing care to loved ones (such as to a mother, aunt and intimate partners) that prevented them from attending classes.

**Transportation.** Some participants lived far from the location where the yoga classes were offered. Therefore getting to class could take a long time, or public transportation may not have been conveniently accessed from the area where they were living.

**Work.** Participants who were able to find employment reported unsteady work. Any work opportunities were sporadic, gave little notice, and, at times, interfered with the yoga classes

**Hygiene.** One participant reported that he was homeless and living on the streets and so had little means to maintain hygiene. He was embarrassed by his body odor. “Like my first class, I was so embarrassed—because I took off my shoes, and blew up the whole room. I was like, ‘Oh, my God.’ It was not okay. So I was like, ‘I’m not coming anymore.’”

### **Reasons for Yoga Attendance**

Participants reported the following reasons why they attended class:

**Taking advantage of a new opportunity.** Many participants reported the desire to learn a new activity and be inspired by something different. One participant described that he was interested in yoga because he was looking for “new things to do because I was so used to doing the same thing over and over. It was just something I wanted to try.”

**Commitment.** A handful of participants noted that they had made a commitment to the study and they do not like breaking commitments. In addition, respect for the ICJ/ FIGHT staff was further reason to maintain the commitment.

**Self care.** Many participants were interested in yoga for the potential to improve their health and well-being, reduce stress and support recovery. “I believe in . . . taking care of myself. You know, I’m learning that, you know, I’m worth something.” Another participant noted the desire to stop dwelling on the negative. “Like I just go into my past and I just be reflecting back like on some stuff, but it wasn’t going to benefit me no type of way. So that’s why I really took these classes.”

**Engagement.** Several participants described the desire to be involved and engaged in life. “Because I wanted to stay focused, I wanted to do something. . . I knew it works. . . I’d rather be involved than not involved.”

**Financial incentive.** A few participants said that the money gained from study assessments was very helpful in supporting themselves without relying on others. “I can supply my own way, to get where I need to go.”

**Enjoyment.** Participants described that once they attended some of the classes they kept attending because they found the classes fun, enjoyable, knowledge building, welcoming, and effective.

### **Recommendations for Yoga Practice**

Participants shared the following recommendations to improve the yoga classes:

**Classes for people who are transgender.** One transgender participant suggested having yoga classes specifically offered to people who are transgender.

**Classes for committed practitioners.** Participants who had high attendance to yoga classes offered advice about participants who had low attendance. One participant noted that it’s not advisable to force a person to practice yoga as they would not fully benefit from the classes. Other recommendations included withdrawing participants from the intervention if they miss more than two classes and not allowing participants to come to class late or leave early.

**Warm-up.** In terms of the content of the yoga classes and the instruction, a few participants recommended having a “warm-up to get the adrenaline flowing.” A few participants also highlighted the importance of easing into more difficult poses and doing preparatory stretches prior to more difficult poses.

**Varied routines.** A few participants noted the value of changing the routine of the classes so as to maintain interest.

**More frequent classes.** Some participants recommended more frequent classes, such as daily or three times a week in order to sustain the benefits of the class. “Make it more consistent so that I could incorporate it more in my life, cause I felt like Monday I was all gung ho, then the overflow would last 'til Tuesday, and that’s it. It’s gone, you know?” Having more frequent classes “would give that continuity, it would give that consistency. So you remember the repetitions, remember, oh this is what I did.” Another participant who had full-time employment suggested that classes be offered on a range of dates, from which participants could choose convenient times. For example, 24 class times could be offered from which participants would be required to attend 12.

**Provide food.** Providing food was suggested, especially when classes were offered during mealtimes.

**Class size.** Participants recommended a class size of five, so that people would get individual attention, but there would also be enough people to maintain a group feel.



## **CHAPTER 8**

### **FIDELITY TO YOGA CURRICULUM**

Through written and verbal reflection, the yoga teachers provided feedback regarding adherence to the teaching protocol and feedback regarding their teaching experiences. In general, the teachers reported that the asanas included in the protocol were too ambitious based on students being new to yoga and students' physical abilities. Teachers therefore found it more important to work on basic coordination than mastery of asanas. The main frustration for teachers was inconsistent class attendance. This was particularly frustrating when teachers felt that students had had a positive experience or accomplishment in class (as by mastering a particular asana and the student expressing interest in progressing), but then did not attend the following week. When students came to class consistently, students were better able to learn asanas and breathing patterns, as the teacher had greater familiarity with students' needs and students had more time to practice.

The main change to the yoga intervention protocol was the inclusion of more restorative poses. The teacher of the first wave substituted classes six and nine with a restorative class (see Appendix G). The instructor's alteration of the protocol to a restorative class was based on the students' needs that day, as they reported being tired and/ or sore. The teacher of the second through fourth waves included some restorative poses in each class and adjusted the sequencing of poses (Appendix G). He found it helpful to end each class with 20 minutes of restorative poses along with more free-flowing conversation regarding yoga practice and students' reflections. The conversation

created a friendly space and built camaraderie among the students and teacher. Other reflections from teachers included the importance of the following points:

### **Intention**

Students were encouraged to consider an intention or purpose for each yoga class. By setting a purpose, students could personalize the class towards their needs and increase personal reflection. The teacher posited that this is one way in which yoga could be integrated with substance use recovery goals. By creating intentions related to substance use recovery, one could reinforce individual recovery goals.

### **Breath**

Teachers found it helpful to reinforce the connection between breath and movement using basic pranayama exercises, such as deep breathing.

### **Guided Relaxation**

For many students, relaxing completely was challenging and it was often helpful for the teacher to speak during restorative poses, as with guided relaxation.

### **Upright Seat**

Teaching a basic upright seat at the beginning of classes was important to adjust posture and everyone connected to the pose quickly.

### **Balancing**

Balancing poses were challenging for most of the students. By using stages to progress towards balancing, students were all able to move to a place of challenge.

**Simplicity**

Generally, teachers felt that the most important components of instruction included building trust and doing so through being straightforward and clear in instruction.

## CHAPTER 9

### DISCUSSION

This randomized controlled trial found that participants assigned to a 12-week yoga intervention experienced statistically significant greater reductions in stress and less substance use than participants assigned to treatment as usual. Additionally, qualitative feedback points to high participant satisfaction with the intervention and its effects, demonstrating that yoga is a feasible and acceptable intervention that can support positive outcomes for returning citizens with HIV and substance use problems.

#### **Primary Outcome: Stress**

Participants assigned to yoga experienced about four points less stress on their three-month Perceived Stress Scale score ( $p < 0.01$ ) than people assigned to treatment as usual, adjusting for the baseline mean stress score. It is possible that, as hypothesized, the yoga intervention provided coping skills, which corrected imbalances in the body's stress response and decreased subjective feelings of stress. Additionally, these coping skills could then be employed to respond more effectively to stressful situations outside of yoga class. This hypothesis is supported by qualitative feedback in which participants described how the classes fostered relaxation, even on difficult days. As described by one participant: "I would come in the class under a whole lot of tension and stress and leave feeling good about myself." Outside of the classroom, some participants practiced what they had learned in the yoga classes, especially breathing exercises (which were easy to employ anywhere and produced an almost immediate calming effect) to deal with everyday challenges, like public transportation, or dealing with a frustrating situation.

### **Primary Outcome: Substance Use**

The GEE model predicted that people assigned to the yoga intervention experienced 21 percent fewer total days of substance use than participants assigned to treatment as usual ( $p < .001$ ), which represented a medium effect from baseline to one month and baseline to two months and a small effect from baseline to three months. It is possible that as hypothesized, the reduction in stress experienced from the yoga intervention reduced the need for participants to use drugs as a stress-management strategy. While this certainly may have been one factor contributing to reduced substance use, the qualitative interviews indicate various other ways in which yoga may impact substance use.

**Connection between yoga and & substance use.** This study's qualitative findings regarding ways in which yoga may affect substance use are similar to purported mechanisms behind yoga's effect on depression (Uebelacker et al., 2010). Similar to Uebelacker et al.'s (2010) theoretical article, this study considers mechanisms related to behavioral, psychological, and biological factors, with the addition of social and environmental factors.

***Social.*** Returning citizens with HIV and substance use problems experience the burden of three stigmatizing and socially isolating categories. This is perhaps why the social support from the yoga classes was so widely cited in participant interviews. In particular, participants appreciated the lack of judgment among classmates and the motivation from seeing fellow participants earnestly engaged in trying out a new and unfamiliar activity. It was also important for participants that this intervention was

offered at a familiar place and with familiar people, as opposed to at yoga studios that attract largely White women with socioeconomic resources.

While participants did not explicitly state that the social support from the yoga intervention impacted their substance use, it is plausible that feeling socially supported made participants feel better so they had less need to use drugs (Granfield & Cloud, 2001). In addition, the themes discussed in the classes touched on recovery topics, so it may be that participants shared thoughts and reflections regarding the recovery process. However, it may also have been important that the yoga classes were not overtly recovery oriented, as one participant commented that he appreciated the yoga class dynamic, one in which people did not offer unsolicited advice, as in recovery meetings.

It will be important for future research to compare the yoga intervention with another group activity so as to control for social support. However, as participants noted, the social support in the yoga class may be unique because people are engaging in a new and different activity that fosters playfulness, acceptance, and nonverbal support. This may make the yoga intervention more effective than other group activities in terms of fostering a supportive class atmosphere.

***Environmental.*** The class environment was quiet and not crowded, which was comforting and calming. It may also have been important that the classes were offered during days and times when ICJ was not hosting drop-in hours, which meant that there were fewer people and less noise in the community center as a whole. This sort of calm and quiet environment may have helped people to feel calm and at ease, which may have been particularly important for this sample that experience uncomfortable living situations in homeless shelters, on the streets or in crowded homes. Being in a calm and

quiet environment for even a few hours per week could reduce the need to use substances as a means to escape from living in uncomfortable environments.

***Behavioral.*** As suggested by Uebelacker et al. (2010), if yoga is experienced as enjoyable and/ or provides a sense of accomplishment through practice, it can positively reinforce further practice of yoga as opposed to other reinforcing behaviors, such as drug use. One participant described: “I wasn’t motivated to use. I was so motivated and focused on something else, that I didn’t have time to think about using at all.” In anticipation of class, this participant would often prepare by not using drugs the day before or the day of class. Because yoga was experienced as enjoyable, time was devoted to the preparation and practice of yoga that might otherwise have been devoted to drug use. Yoga may also make the experience of drug use less enjoyable. For example, one participant discussed how smoking a cigarette after class was immediately distasteful, as his lungs had opened up and his body was limber, so that the experience of smoking was “brutal.” With continued practice of yoga, it is possible that the body would change in such a way to make drug use experience less enjoyable.

Another way in which yoga can impact behavior to reduce substance use, is in the use of yoga postures to distract one’s self from urges. One participant described doing yoga postures when having the urge to drink at night, instead of going to the liquor store. In this way, yoga distracted him from his urge long enough for the urge to subside and he no longer had the desire to go to the liquor store (Marlatt & Donovan, 2005)

***Psychological.*** Yoga may provide an alternative focus to negative or self-defeating thoughts, and yoga may also impact the content of thoughts by increasing feelings of self-efficacy and confidence (Uebelacker et al., 2010). In this study, yoga

helped participants stay present. Participants discussed how attention to the breath both within and outside of class could bring attention back to how the body is feeling as opposed to focusing on worries and concerns. This ability is especially meaningful given that this is a population that faces many stressors and challenges in their everyday lives. Focus on present sensations can potentially decrease negative self-talk that in other contexts could encourage substance use.

While not only changing the process of cognitions, yoga may also change the content of cognitions by increasing self-efficacy and confidence. Participants discussed how they had confidence to make different choices around their substance use when they started looking at themselves in a different light. One participant described that through yoga practice, he started to “feel good” about himself, a feeling he hadn’t experienced in a long time, which facilitated thoughts about reducing his substance use. Another participant described having “confidence” to say that drugs weren’t more important than her “self-worth” or “health” after yoga practice. Therefore, yoga practice facilitated positive thoughts, which supported reduced substance use. These thoughts of believing in one’s own health and self-worth may be especially important for people living with HIV who experience the daily reality of an illness that can compromise the body’s functions and lead to death if one is not vigilant about taking ART medications.

**Biological.** It may be that yoga practice can support reduced substance use by changing the way the body responds to stress through regulation of the autonomic nervous system and neurotransmitters. With reduced stress reactivity, a person would have less risk to seek out drugs to alleviate stress. This study’s examination of indirect biological measures of stress (heart rate and blood pressure) did not find statistically



significant differences among those assigned to yoga as compared with participants assigned to treatment as usual. Because yoga class attendance was relatively low, it is likely that on a whole, participants did not attend enough yoga sessions to experience significant improvements in heart rate and blood pressure, even if they may have felt better subjectively. Additionally, there are factors that contribute to heart rate and blood pressure that this study did not account for, including time of day that readings were taken (Sheps, n.d.) and nutrition (Steffen, Kroenke, & Yu, 2005). In future research, it would be helpful to examine changes in heart rate and blood pressure among people who practice yoga immediately before and after participation in yoga and to compare these rates with those of people who do another psychosocial intervention. Therefore, the readings are more likely to reflect heart rate changes related to the actual intervention. In addition, improved attendance might facilitate heart rate and blood pressure changes, as one yoga study with good attendance found statistically significant changes in heart rate and blood pressure (Cade et al., 2010). A second biological mechanism in which yoga may impact substance use is in alleviating ailments, such as constipation, COPD and back pain. Reducing pain and discomfort through the practice of yoga (Bonadies, 2004), removes the need to use substances as a means to alleviate bodily pain.

### **Alternative Hypothesis to Explain Change in Primary Outcomes**

While the quantitative and qualitative findings support the hypothesis that yoga was associated with stress reduction and reduced substance use, there is an alternative hypothesis that may have also impacted improved stress and substance use outcomes among those assigned to yoga. It may be that participants assigned to yoga were experiencing less challenges and barriers at baseline, so that they had improved outcomes

in the following three months. For example, at baseline those assigned to yoga had one more year of education, had a few points less stress on the Perceived Stress Scale and had seven less days of substance use in the previous 90 days to the baseline interview.

Additionally, follow-up rates were a little less in the yoga group (with seven people lost to follow-up in the yoga condition and three people lost to follow-up in the treatment as usual condition). It may be that participants who were in greater distress at program completion were not included in the analyses, which may have skewed the results in favor of the yoga group. However, reasons for loss to follow-up were almost fully accounted for (except for two people from yoga). In sum, perhaps the yoga group that was interviewed at program completion was a group with fewer challenges and so had less stress and less substance use throughout those three months than participants in treatment as usual. However, the differences in the two treatment groups are slight.

Additionally there are other baseline demographics that point in favor of the treatment as usual group, such as zero people in treatment as usual reporting ART non-adherence and three people in yoga reporting ART non-adherence. Further, even if baseline differences between the two groups partially contributed to the findings, it is unlikely that they fully account for the findings. In particular, the qualitative findings clearly point to participant belief in the efficacy of yoga to positively impact stress and substance use.

It may also be that the substance use findings are not completely accurate as the substance use data collected for this study were self-report and depend on accurate recall of the participants. Having biological data would have increased confidence in the treatment effect. However, the Time Line Follow Back periods were relatively short (about one month), so that recall was relatively easy for participants.

### **Secondary Outcome: ART Medication Adherence**

There was no significant difference in ART medication adherence between the yoga and treatment as usual groups at program completion. Prescription refill data indicate that participants in both groups were refilling their ART medications 74% (SD=30) of the time at baseline and 75% (SD=35) of the time at the three-month follow-up assessment. The finding of no difference in ART adherence between the two groups does not support the hypothesis that a decrease in stress and substance use would facilitate improved ART adherence. While not statistically significant, the yoga group did experience an increase in ART adherence while the treatment as usual group experienced a decrease in ART adherence at program completion, representing a medium effect size. There are several factors that likely contributed to the lack of statistical significance. First, the sample size was small. Second, the effect size for change in perceived stress was small, so it is likely that there was not a clinically significant enough change in stress to actually cause a change in ART adherence. Third, a large proportion of this sample was virally suppressed (70%) at baseline and at program completion (65%) (six people who were virally suppressed at baseline did not have their viral load analyzed at three-months, which likely contributed to the slight decrease in viral load suppression) and the sample had high ART adherence rates. In sum, because the participants were generally adherent with their ART medications, there was little improvement to be made. It may be that among larger study samples with lower levels of ART adherence and with higher yoga attendance rates, a significant effect could be found.

## **Effects of Attendance**

Participants assigned to the yoga intervention attended an average of four classes. This low attendance is at odds with the largely positive qualitative feedback about the yoga classes. However, one factor skewing the attendance rate is that eight people (22%) attended zero classes, so the attendance rates weren't necessarily a reflection of whether or not a participant liked the intervention, but rather a reflection of the many challenges and barriers that people faced in maintaining attendance. Among people who attended no classes, reasons for non-attendance included incarceration (n=3), surgery related to cancer (n=1), finding work (n=1), a bone spur in the hip that made walking painful (n=1), intensive outpatient treatment schedule conflicts (n=1), and unknown (n=1). One of the issues with this study's treatment design was that the enrollment period for each wave lasted approximately three weeks. Some people were enrolled up to three weeks prior to the intervention start. While this was necessary in order to enroll a sufficient sample prior to starting the intervention, it also may have contributed to participants' lives changing in such a way that attendance was no longer possible, even if it had been at baseline. Future study designs could start the group intervention within the same week as a person is enrolled and continue with a rolling admission until the class capacity is reached. In this scenario, participants could continue attending classes until they attend 12 classes. A second potential design idea is to compile an extensive list of potential participants to be screened and make all the baseline appointments within one week. However, this procedure would not have been feasible with this study because the population from which this sample was drawn was relatively small.

Another factor that contributed to low attendance rates included insurmountable barriers that prevented people from attending more than a few classes. Reasons for low attendance among this group included incarceration after attending just one or two classes or serious health problems (for example one participant was in a coma for a few weeks). And yet for others, while regular attendance was difficult, due to minor scheduling conflicts, fatigue, transportation difficulties and drug use, it was not impossible. Future interventions could pair the yoga classes with an existing reentry program that requires attendance. Further, food or money could be provided in order to reimburse people for their time and effort. Finally, offering the classes on a range of dates with the requirement that participants would need to attend a certain amount of those classes (such as at least 10) would provide participants with more options to make the classes work with their schedule. While this model might reduce the social support from the group, it would likely improve attendance rates.

This study did not provide any evidence regarding how many yoga classes it was necessary to attend in order to be effective. Qualitative feedback indicates that attending even one class could contribute to positive outcomes, as one participant described not enjoying smoking a cigarette after class and falling into a deep sleep after the class. Another participant, who attended just four classes, said that yoga was a major contributor to his reduced substance use. While he began the intervention with no belief that yoga would impact his life, he reported that it was a major factor in supporting a reduction in substance use and stress. He had a nine point decrease in perceived stress from baseline to three-months and his substance use changed from 28% days of use at baseline to 73% at one-month to 14% at two-months and finally 11% at three-months.

Among people who attended a majority of the classes, they often reported that the physical effects of yoga increased with more classes attended as their muscles became more limber and they had more familiarity with the poses. In sum, the qualitative data indicated that attending just one class could produce immediate short-term effects (like deep sleep). However, the more classes attended the greater the effect on the body and the greater ease with the poses.

The quantitative data reflect that attendance was not a significant predictor of stress or substance use. Attendance was likely not a predictor because of the small sample size ( $n=29$ , people assigned to yoga who completed the three-month follow-up). In addition, it may be that people who came regularly to the yoga classes were those who had less stress and less substance use to begin with which helped them to maintain attendance to scheduled activities, such as yoga.

The qualitative and quantitative findings regarding how attendance impacts the effects of yoga are equivocal. Qualitative reflections highlighted that attending just one class can have positive impacts. However, other participants discussed the value of regular attendance, which helped participants feel more comfortable with the practice and greater effects on the body and mind. Future studies can include interventions of greater intensity, longer follow-up assessment periods to see how attendance may impact long-term changes for participants, and larger sample sizes to assess the effects of attendance.

### **Yoga Classes**

Participants and instructors had very similar feedback regarding what were the most helpful and important components of a strong yoga practice. These themes are listed below as suggestions for future yoga interventions to incorporate.

**Casual conversation.** Both instructors and participants noted that casual conversation facilitated an easy-going atmosphere that supported participant comfort in the class and fostered camaraderie among participants. This is an interesting observation as yoga classes conducted in yoga studios have very limited student conversation. It may be that conversation is helpful in building trust and comfort with people who are new to yoga. Casual conversation may also foster a non-competitive environment, by setting the tone of yoga as a group-learning project.

**A new activity.** Participants remarked that one of the things that drew them to yoga practice was it being a new and somewhat unfamiliar activity. In life, and in recovery, it is easy to get into a rut. Trying new activities and having a new outlook can encourage growth and greater understanding of one's self. However, it was also important that participants opened themselves up to this new activity. With the understanding that yoga will not become a regular activity for everyone who tries it, instructors can encourage students to have an open mind regarding yoga practice. Students can be encouraged to observe their reactions to the different components of the classes and take what is valuable to them.

**Sequencing of the yoga poses.** Instructors identified that the protocol was too ambitious and adjusted it accordingly, adding more work around basic coordination as preparation for poses and adding more restorative poses. These changes are consistent with participant feedback that called for more restorative poses. The participants in this study had an average age of 44, and it is noteworthy that the only participant to withdraw from the study because he did not enjoy the yoga classes was the youngest study participant at 24 years of age. It is important for the yoga instructor to adjust the tempo of

the class based on the age and physical ability of the students in the class, and offer modifications for all poses. Additionally, there was one participant who found the poses to be repetitious. While other participants noted that the repetition was important to gain mastery over poses, some variation may be important to maintain student interest.

**Clear and simple instruction.** Instructors strove to give directions in straightforward and direct terms. In turn, participants noted that instruction was clear and that the instructors always offered modifications. Participants highlighted how important it was for instructors to maintain a balance of encouragement to try new poses, while not over stretching. Finally, instruction should reflect understanding that everybody has different breathing cadences and people may feel poses in different areas of the body.

**Breath.** Both participants and instructors recognized the importance of breathing exercises. Instruction can emphasize how these exercises can be applied outside of the classroom.

**Guided relaxation.** Participants found it calming and soothing to hear the instructor's voice through restorative poses and instructors found that talking through poses helped participants stay in those poses. This may be an important component particularly with beginning level yoga classes.

**Setting an intention.** Participants appreciated the non-judgmental nature of their classmates. The yoga instructor had an important role in setting a non-competitive and supportive class tone. One way in which instructors did this was through reminding students to go at their own pace. Another practice that may have fostered this non-judgmental space was through the suggestion to set a personal intention in the class,



which may have encouraged students to look inward and make meaning out of the class for themselves, as opposed to focusing on what others were doing.

**Diversity in the yoga community.** The yoga industry and yoga practitioners need to do a better job of incorporating and welcoming people from diverse racial, ethnic, gender, and socioeconomic backgrounds. Even if yoga studios claim to welcome practitioners from all backgrounds, people don't feel comfortable coming to a studio where they don't see people who are similar to them. Yoga studios can take proactive steps by offering discounted community classes and providing those classes in various community settings. Further, studio teachers can teach classes within those communities, as at local community health centers.

### **Strengths and Limitations**

This study adds to the existing research that supports yoga's association with stress reduction. It also provides initial evidence of the role that yoga can play in supporting reduced substance use, particularly among returning citizens with HIV, a group that faces many challenges and are at a high risk for relapse. The qualitative feedback also sheds light on potential mechanisms as to how yoga may impact substance use, including behavioral, biological, environmental, psychological and social changes, findings that support Uebelacker et al.'s (2010) article that examined yoga's effects on depression.

Limitations of this study include lack of a biological measure for substance use, a small sample size and lack of an active control group. In addition, the low attendance rates to yoga classes limit our understanding of the full potential effects from yoga practice. Future research studies can increase the sample size, add an active control group

(such as a stress reduction group, a meditation group or an exercise group) and use biological measures for substance use. To better understand the potential of yoga to support well-being outcomes, future studies can also strive to increase yoga class attendance. Research designs should fully consider the challenges that this population faces, by providing incentives for peoples' time and effort in attending each yoga class and providing a greater range of yoga class times.

## **Conclusion**

This study demonstrates that yoga, a low-cost and feasible intervention, can support reduced substance use and stress among returning citizens with HIV and substance use problems through various behavioral, biological, environmental, psychological and social mechanisms. At the same time, yoga is not a solution that will eliminate problematic substance use and stress for this population, a group that faces sizeable challenges and barriers that require multiple and varied individual and structural interventions. Additionally, yoga is not a practice that everyone will embrace. However, yoga is a complementary treatment that can and should be offered as an option for returning citizens with HIV and substance use problems to support substance use recovery and stress reduction.

## APPENDIX A

### THE EIGHT LIMBS OF YOGA

The eight limbs of yoga, as defined in Patanjali's Yoga Sutra, are the physical and mental practices that comprise yoga and are meant to improve overall well-being. The limbs are sequential, each one builds upon the former.

1. Yamas: Ethical standards so as to treat the self and others with respect, including the practice of the following:
  - Ahimsa: non-violence
  - Satya: truthfulness
  - Asteya: non-stealing
  - Brahmacharya: self-restraint
  - Aparigraha: generosity
2. Niyamas: Self-discipline, including the practice of the following:
  - Saucha: cleanliness. Kriyas are practiced to purify the physical and spiritual body and include:
    - Kapalbhata breathing (also classified as pranayama): forceful exhalations and passive inhalations.
    - Tratak: keeping the eyes fixed on one point, as in meditation.
  - Samtosa: contentment
  - Tapas: commitment
  - Svadhyaya: self- study (Sovik, 2014)

- Isvara pranidhana: surrendering to the universe or higher being (however one conceives of it.)
3. Asanas: Physical postures to stretch and strengthen the body.
  4. Pranayama: breath control to bring balance to one's moods and emotions.

Pranayama exercises include:

- Diaphragm breathing: To facilitate relaxation, this breathing involves diaphragm contraction; inhalation and exhalation through the nose; breathing at a rate of 1-3-2, with 1 denoting the length of time for the inhalation, 3 denoting the length of time for retaining the breath and 2 denoting the time for exhalation (Bunk, 1978).
  - Alternate nostril breathing: To facilitate relaxation, energy and breath awareness, this breathing involves inhalation through one nostril, retaining the breath, exhalation through the opposite nostril and retaining that breath (Bunk, 1978).
  - Bhastrika: Rapid breathing, contracting the diaphragm to inhale air and forcefully exhaling through the nose (Bunk, 1978).
5. Pratyahara: withdrawal of the senses to focus attention on internal processes rather than the external world.
  6. Dharana: concentration on a single object. For example, in basic instruction of meditation, one is often instructed to focus on one's breathing.
  7. Dhyana: meditation. Instead of focusing on one point (as in dharana), one maintains awareness of multiple sensations or objects. For example, when

maintaining an asana, one does not concentrate on one part of the body but maintains awareness of all the body throughout the pose (Iyengar, 1988).

8. Samadhi: integration. Through meditation, the practitioner merges with the focus of the meditation, transcending the self, and finding inter-connection with the universe.

## APPENDIX B

### YOGA CURRICULUM FOR YOGA INSTRUCTORS

#### Logistics:

*Study population:* Everyone will have HIV and have or recently experienced substance use challenges. The research team will also let you know if there are other issues that have been discovered through research assessments, such as blood pressure concerns.

*Class introductions:* When everyone has arrived at the first class, the research coordinator will introduce the class members to the teacher and explain that the teacher is a resource for questions regarding the class and yoga. For all other study questions or concerns, students can reach out to the research coordinator at the number provided on their consent form. The research coordinator will ask students to “Please turn your cell phones off. If there is an emergency call you are waiting for, please put your phone on vibrate. Respect everyone’s space. There will be times in class when you will do quiet meditation, we ask that you respect each other and refrain from talking in order to allow everyone to get the most out of those quiet periods.” The research coordinator will explain that attendance is important to get the most out of the classes. If you can’t make a class, please let the research coordinator know.

*Injuries:* At the beginning of every class, ask if there are any injuries or if anyone has any questions or concerns, in particular about any home practice that people may have been doing.

*Rest:* Encourage students to rest as needed during the class

#### Class 1: What is yoga?

#### **Discussion (5-10 minutes) Sitting on mats**

*Ask:* Does anyone have any ideas about what yoga is?

*Explain:* Yoga is a mind, body, and spiritual practice originating in India over 2000 years ago. The practice of yoga is not religious; all religions are welcome and people who do not practice religion are welcome.

So what does yoga mean? Yoga means union. It is practiced in order to attain greater union between the body, mind and wider universe.

Today there are many different types of yoga that are practiced and each incorporates a different amount of physical exercises, breathing exercises and meditation. In general, yoga today is more focused on physical exercise than it historically has been. The idea

behind this is that by doing different physical and breathing exercises, we can relax the body more. When the body is more relaxed, our mind can then relax better. With a more relaxed mind we can be more present to what our body is feeling and more aware about what is going on in our environment around us, thus achieving more of a union.

The body postures that we practice are called ‘asanas’ in Sanskrit. Sanskrit is an ancient South Asian language. During the class I will refer to asanas by their Sanskrit name and their translated name in English. These asanas are designed to strengthen and relax the body. We will also do breathing exercises near the end of each class, called pranayama. Pranayama also helps us relax. Both asanas and pranayama help us get into a state where we can meditate, which we will also do at the end of class.

Our basic routine each week is that we will start off discussing a different component of yogic philosophy followed by a set of physical and breathing exercises and meditation. I will also suggest one mind or body relaxation technique that you can try each week daily at home. The more that you practice what we learn here, the greater benefits you will experience. This week, I will ask you to take a few minutes daily and practice any one of the physical poses that we learned today.

Each week I will start the class asking if anyone has any injuries or pain. Knowing this will help me adjust postures for you, if needed.

Any questions?

#### **Pranayama practice- reclined or sitting** (5 minutes)

Abdominal breathing

*Explain:* Place one hand on the abdomen and one hand on the chest. Inhaling through the nose, bring the breath down to the abdomen, so that the hand on the abdomen moves up on the inhale and moves down on the exhale. I am going to suggest a count for you to follow on your inhales and exhales. If it doesn’t feel right for you, if it feels like the inhales or exhales are too long or short for you, go at your own pace. Keep your mind focusing on the breath. When the mind wanders, bring it back to watching the breath.

*Count out loud:* 6 seconds inhale, 6 seconds exhale (do this for a minute). For the last few minutes allow students to inhale and exhale at their own pace. On the exhales, feel your body relax more, letting go of any tension.

#### **Asana Practice (60-65 minutes)**

***Heart bench***

***Sukasana with hands interlaced and pressed up to ceiling***

***Sukasana with side bends***

***Dandasana (staff pose)***

***Paschimottanasana (seated forward bend)***

***Marichyasana III (easy twist)***

***Vasistasana (side plank)*** with bottom knee down for beginners. Do one side and then stay on side to do parigasana. Then switch sides and do vasistasana followed by parigasana.

***Parigasana (gate pose)***

***Balasana (childs pose)*** May need to put blanket or block between feet and buttocks. Also may need to rest head on a block or forearms. (2 minutes)

***Sit in Virasana while teacher demonstrates downward dog***

***Adho mukha svanasana (downward dog)***

***Tadasana (mountain pose)***

***Uttanasana (standing forward bend)***

***Virabhadrasana II (warrior 2)***

***Tadasana***

***Utthita trikonasana (triangle)-*** Probably use blocks

***Tadasana***

***Utthita parsvakonasana (extended side angle pose)***

***Tadasana***

***Virabhadrasana I (warrior 1)***

***Tadasana***

***Prasarita paddothanasana (wide legged forward bend)***

***Tadasana***

***Parsvotanasana (intense side stretch)***

***Tadasana***



*Vrksasana (tree pose)*

*Transition to floor with uttanasana, plank and slowly lower*

*Rest on stomach*

*Salabhasana (locust pose)*

*Balasana*

*Eye of the needle/ Pigeon*

*Setu Bandha sarvangasana (bridge pose)*

*Vipariti kirani*

*Reclined spinal twist*

**Meditation: Body Scan** (5 minutes) reclined: Let go of the counting of the breath. Place your arms at your side. In this meditation we will bring our attention to how our body is feeling. I will guide you through this meditation. If you feel your attention and thoughts wandering during the meditation, don't worry about it. Just notice it and then gently bring the attention back to the awareness of the body.

Gently close your eyes. Bring your awareness to your feet, noticing how your toes, the soles of your feet and the heels feel. Notice if your feet are warm or cold, if they are tense or relaxed. (pause) Let go of awareness of your feet and now shift awareness up to the ankle and the lower legs and up to the knees. Notice if the leg feels relaxed or tense. Notice the feel of your clothing on the leg. (pause) Shift your awareness to the upper legs and the hips up to your waist. Feel the weight of your body on the floor, noticing what points of your body make contact with the floor. (pause) Now move your awareness to the abdomen. Feel the rising and falling of the abdomen with the breath. Notice if the inhale and the exhale are equal or if maybe the inhale is shorter than the exhale. Or maybe the inhale is longer than the exhale. Notice your breath. (pause) Now bring your attention around to your lower back and the upper back, noticing where the back is touching the floor. (pause) Now bringing the attention around to the chest and the shoulders. Notice if these areas are relaxed or tense or tight (pause). Now bringing your awareness down to your fingers. Feel each finger and notice whether they are curled or stretched straight. Notice where they are making contact with the floor.(pause) Move the awareness to the forearm and the elbow and then to the upper arm. (pause) Now allowing your focus to drift to where your arms meet your shoulders and then moving your focus to the neck area. Feel where there is tension or tightness. Feel the back of the head on the ground. (pause) Bring attention to the ears. And now the jaw. Notice areas of tightness. (pause) Now focusing on the mouth, the nose and the eyes. Notice if the eyes feel relaxed

in their sockets or are bulging a bit. Notice if the right eye feels the same as the left eye. (pause) Now, having concentrated on each part of the body separately, notice how your body feels as a whole. Notice feelings of relaxation or tension. Notice feelings of warmth or cold. Feel appreciation for your mind and your body for having the patience to try out this meditation.

***Savasana (corpse pose)*** (5-10 minutes)

After, roll to your right and come up to sitting in sukasana.

**Close class:**

*Explain:* I end class with a Sanskrit word that is a gesture of respect and used in both greetings and farewells. Putting my palms together, I bow slightly and say (and you are welcome to join): Namaste(na-ma-stay').

Remind students about home practice of trying out any one posture daily.

Class 2: Dealing with stress

**Discussion (5-10 minutes): sitting on mats**

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

*Explain:* This week and next week we will be practicing the same asanas, pranayamas and meditations that we did in the first class, to work on getting those down. **Take home exercise:** Do the body scan meditation that we will do at the end of class on your own.

Today we're going to talk about dealing with stress. We all face stressors and challenges. Reentry in particular has a lot of stressors. Yoga can help us learn to deal with these stressors better.

*Ask:* What sort of things happen to us physically when we get stressed? Anyone have any ideas? – The heart may race, our blood pressure may rise, you might begin to sweat and you have a flood of energy. This sort of reaction might be helpful if you have to get away from a really dangerous situation. However, if we react like this to the daily stressors that we have, over time, chronic stress can take a toll on the body and brain leading to various health problems.

So how does yoga help us to remain calm in stressful situations? Some of the yoga poses that we try together are challenging, and these challenging poses may cause you to feel uncomfortable. As we learn to hold these poses with a calm mind, focusing on the breath, the poses actually train us how to remain calm in stressful situations. In other words, the physical challenge of a yoga pose is the same thing as a stressor. And when this physical challenge is met with a calm response, it trains us to react to daily stress in a calm and steady way.

So what does this all mean for our yoga practice together? Firstly, when we are faced with a challenging pose, focus on your breathing to help you stay steady in the pose and

be kind to yourself in the pose. It might be that this pose is too physically challenging for you right now and if so, don't force yourself into the pose. But if you are physically up for it, challenge yourself to stay in the pose but also don't push yourself too deeply. Secondly, start to notice how you react to the different yoga poses, which can give an indication of how you tend to react to stress in life. For example, when faced with difficult poses, some people might ignore the pose all together and not do it while some might try to push too far into the pose, even though their body is not ready to go that far. When you are faced with a challenging pose, think about staying in the pose, noticing the sensations that the pose is causing, but also not pushing yourself too violently into the pose. Finally, in our yoga practice we do both strenuous and gentle poses. By alternating from challenging and gentle poses, we train our bodies to be able to transition from stressful situations to non-stressful situations. When we are in the relaxing pose we let go of stress that we may have felt in previous challenging poses. With that, let's begin in a relaxing pose. . .

**Pranayama /Asana/ Meditation Practice:** Same as class 1

Class 3: Yoga is the control of thoughts in the mind

**Discussion (5-10 minutes):**

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

*Explain:* This week and for the next two weeks we will be practicing the same postures/ asanas, pranayamas and meditations, to get those down, before trying out new exercises.

**Take home exercise:** Try doing a few of the asanas along with the body scan meditation.

Today I wanted to start off briefly talking about how yoga practice works to clear our thoughts.

Our minds are filled with thoughts, some good and some bad. We are thinking about regrets and happy times from the past. We are thinking about hopes for the future. We are thinking about the responsibilities we have. We are thinking about maintaining our health. We are thinking about desires.

All these thoughts that we experience can be overwhelming. It makes it difficult to stay in the present and have a clear sense of where we are at in the present moment when we are bombarded with thoughts.

Yoga seeks to help us see more clearly, and to reduce the clutter of thoughts in our head. It does this through meditation. To help us get to that state of meditation, we do the asana practice and pranayama practice which help focus our mind on these restorative practices, that then bring more calm to our mind.

**Pranayama/Asana/ Meditation Practice:** Same as class 1

Class 4: Sit with discomfort

## **Discussion:**

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home? Today we will be adding a couple of new postures/ asanas and we will be trying out a new meditation. **Take home exercise:** Try out the new meditation that we will try at the end of class. The research assistant will give you a handout with some of the postures illustrated so that you can remember.

### *Explain:*

Today we are going to talk about learning to sit with pain and discomfort. Pain and suffering affects us all. We will likely experience pain at some point in our lives. This pain can take either a physical or mental form. For example- getting punched in the face may create a physical pain, whereas dealing with reentry challenges like facing discrimination because of having spent time in prison may create mental tension.

(*Ask:* Can anyone think why experiencing discomfort might be a good thing?) Pain is good in that it is an indication that something is hurting you and something needs to change. For example, if you run your hand under hot water and your hand burns, you know to take the hand out of the water. However, it is not always so easy to break free from pain. For example, mental states like feeling sad and physical states like experiencing withdrawal from drug use are not so easy to stop. So in situations when you are unable to escape the pain, yoga can help us to sit with the pain and discomfort.

So how can yoga practice do this? Through trying out different asanas and pranayama practice, your mind and body is challenged to try out different exercises that are not always comfortable right off. This challenge helps teach us to sit with discomfort. Meditation also helps us sit with discomfort. Meditation can be very uncomfortable initially- it may hurt to sit in a certain position. It may be hard to sit with our thoughts in silence. With practice though, we learn greater acceptance of discomfort. With acceptance, of such uncomfortable situations, the discomfort starts to decrease.

### **Pranayama practice- reclined or sitting** (5 minutes)

*Explain:* Today we will learn Ujjayi breath, which means breath of victory. When breathing in this way the lungs are fully expanded, so that the chest is puffed out like someone who is feeling victorious. It has a couple of purposes: One, it stimulates the sinuses and the back of the throat, which, in turn, promotes mental clarity and focus. Second, it creates a gentle sound, which gives the mind something to focus on, to help the mind become more still.

Ujjayi breathing is done by keeping the mouth closed, and just breathing through the nostrils. It sounds like this. . . (demonstrate). To get this sound, you have to tighten the throat, so you will sound kind of like Darth Vader from Star Wars.

It can be tricky to get down. One way to practice getting the sound is to say the sound “haaah” with your mouth open. Now try making the “haaah” sound with your mouth closed and keep the same throat tightness as you inhale as well.

### **Asana Practice (60-65 minutes)**

***Heart bench***

***Sukasana with hands interlaced and pressed up to ceiling***

***Sukasana with side bends***

***Dandasana (staff pose)***

***Paschimottanasana (seated forward bend)***

***Marichyasana III (easy twist)***

***Vasistasana (side plank)*** with bottom knee down for beginners. Do one side and then stay on side to do parigasana. Then switch sides and do vasistasana followed by parigasana.

***Parigasana (gate pose)***

***Balasana (childs pose)*** May need to put blanket or block between feet and buttocks. Also may need to rest head on a block or forearms. (2 minutes)

***Adho mukha svanasana (downward dog)***

***Tadasana (mountain pose)***

***Uttanasana (standing forward bend)***

***Virabhadrasana II (warrior 2)***

***Tadasana***

***Utthita trikonasana (triangle)***- Probably use blocks

***Tadasana***

***Parivrtta trikonasana (Revolving triangle)***

***Don't Do: Utthita parsvakonasana (extended side angle pose)***

*Tadasana*

*Don't Do: Virabhadrasana I (warrior 1)*

*Virabhadrasana III (warrior 3)*

*Tadasana*

*Prasarita padmothanasana (wide legged forward bend)*

*Tadasana*

*Parsvotanasana (intense side stretch)*

*Tadasana*

*Vrksasana (tree pose)*

*Transition to floor with uttanasana, plank and slowly lower*

*Rest on stomach*

*Salabhasana (locust pose)*

*Balasana*

*Eye of the needle/ Pigeon*

*Setu Bandha sarvangasana (bridge pose)*

*Vipariti kirani*

*Reclined spinal twist*

**Meditation: Dealing with Difficulties** (reclined ) (5 minutes):

*Explain:* Check inside your body and find a place that feels good right now, pleasant, at ease or at the very least, neutral. Let your attention go to this part of the body that feels good, wherever you have chosen. Let your attention rest there, notice how this part of the body feels. Let your mind relax. (pause)

And now, if there is a difficult emotion that you are dealing with or a pain or ache in the body that you feel, let your attention go to that. So it could be a pain in your shoulder or a headache, or it could be an emotion like a sense of sadness or anxiety or anger. If it is an

emotion that you are dealing with, notice where you feel that emotion in your body. Continue to breathe. (pause)

Now, return your attention back to the area of your body that feels at ease. Noticing it and relaxing. Giving yourself a break from the unpleasant emotion or body ache. (pause)

Now, return your attention to the part of the body or emotion that is causing you pain or discomfort. Notice any tightness or tension that you might be feeling in that part of the body. (pause)

Now again, bring your attention back to the neutral part of the body. Stay present and alert, feeling safety with the connection to that place. (pause)

Now staying connected to this safe place in the body, cast a sidelong glance to the uncomfortable area. Is it possible for you to stay connected to the area that feels good, while also noticing the area that feels unpleasant? Keep 75% of your attention on the part of the body that feels good. With a sidelong glance, just noticing this unpleasant area, notice whether it is growing, shrinking, staying the same. . . (pause)

Now just consider bringing a feeling of kindness to yourself and compassion for the pain that you are feeling. We all feel pain at some point, as we all feel happiness at some point.

***Savasana (corpse pose)*** (5-10 minutes)

After, roll to your right and come up to sitting in sukasana.

Class 5. Accomplishment

### **Discussion:**

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

**Take home exercise:** Try out a few of the asanas with the meditation for difficulties.

*Explain:* We are now a third of the way done with our 12-week yoga course.

I wanted to take this opportunity to congratulate you for trying out this practice of yoga and for having the patience and dedication to try out something new.

Your patience is an important part of the yoga practice, as the benefits that you will take from yoga require time and dedication as you are giving it now with this program.

If you are patient and determined, you will be rewarded in your practice. Through regular practice of asanas, pranayama and meditation you will be rewarded with benefits that might include less anxiety and a more calm mind. But this will take time and patience.

So in today's class, we will focus on feeling the sense of accomplishment from all that you have learned thus far. At the same time, I challenge you to continue to exercise patience and trust in what you have yet to learn.

**Pranayama/ Asana/ Meditation:** Same as class 4

Class 6. Non-attachment

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

**Take home exercise:** Try out a few of the asanas with the meditation for difficulties. (same as last week)

*Explain:* Two weeks ago we talked about pain and how yoga can help us become more aware of physical and mental pain and that some of the physical postures or asanas can help alleviate physical pain. Today we will talk about something that can cause both physical and mental pain- that of attachment. Attachment means that we are attached to something or someone so much so that it hurts us when we can't get that thing. Can anyone think of something that a person might be attached to? (For example: drugs, certain foods, people . . .)

So what is the problem with attachment? If something makes us feel good, why is that a problem? The problem is that when we cannot have the thing that we are attached to in life, we suffer. And if there is anything that is certain in life it is that life is in a constant state of flux. Therefore, we will not always be able to get or have that thing that we are attached to.

Yoga seeks to attain non-attachment or detachment from negative things we are attached to. So how is a person able to detach? - Through the ongoing practice of awareness of these attachments. Through awareness, these attachments gradually weaken. We also might find other more positive things or people in our lives that fill the void that is left by losing the negative thing to which we were attached.

In yoga, we cultivate this non-attachment through practice of the asanas, pranayama and meditation. We are not critical of ourselves for holding on to attachments, but we are aware of it. We are also aware that these attachments do not define us, but they have just been a part of our life. In meditation, we might have thoughts about our attachment. That is fine, have the thought, acknowledge it and then go back to your focal point in meditation. This follows in life; when we have thoughts about a negative attachment, let the thought come but then go back to living your life. Also, remind yourself that these thoughts of attachments are just that, thoughts. Thoughts are not permanent and as soon as they come, they also go.

This non-attachment takes practice and is not easy to achieve. Today we will try to detach from our reactive mind, from the many thoughts that we are having. As we are in class, focus on the postures and let go of thoughts.

**Pranayama /Asana/ Meditation:** Same as class 4



## Class 7. Taking Care of Yourself

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home? Today we will be adding a couple of new postures/ asanas and we will be trying out a new meditation. **Take home exercise:** Try out the new compassion meditation that we will try today.

Today I wanted to talk about taking care of ourselves. You may have heard the expression “before you can take care of others, you must take care of yourself.” If we don’t take care of ourselves, we do not perform at our best, and so have less capacity to take care of others.

Many of us are unaware of the degree to which we don’t take care of ourselves. Some examples are being judgmental with ourselves, staying in an unhealthy relationship, eating too much, holding on to resentment, not taking time to rest, not forgiving ourselves . . . When these things get routinized we forget that things don’t actually have to be this way and we might not even be aware that these things are taking a toll on our bodies and minds.

In yoga, ahimsa, which means the practice of non-violence, is an important practice. This non-violence starts with how we treat ourselves. Non-violence means true compassion and unconditional love for ourselves.

Today we will practice ahimsa or non-violence to the self, by taking care of ourselves in the yoga practice. With each pose do not stress about getting the pose exactly right. When we stress in the practice, this can create tension in the body, which makes it even more difficult to get into that asana. So allow your body to stay relaxed in each pose and let your mind stay soft and gentle as well. Do not beat yourself up mentally about doing poses perfectly. Be gentle with the body and mind; refuse to get caught in believing that things have to be a certain way (that you have to get into a pose in a certain way) in order for you to be happy. Be proud of yourself that you are treating yourself well today by making it to the yoga class.

### ***Pranayama: 2:1 Breathing (reclined or sitting) (5 minutes)***

*Explain:* Allow your eyes to close if that is comfortable. Start noticing your inhale and your exhale, inhaling and exhaling through your nostrils. Breathing normally, at your own pace, focus on your breath (for a minute).

Now we will try to extend the exhalations, making them longer than the inhalations. By doing this, we can slow our heart rate down, bringing on a feeling of relaxation. Follow my count for your inhalations and exhalations. However, if you feel like the pace that I instruct is not good for you, if it feels too slow or too fast, go back to your own pace.

So now, on your next inhale, inhale for a count of 1, 2, 3. And then exhale for 1, 2, 3, 4, 5. Inhale: 1, 2, 3. Exhale: 1, 2, 3, 4, 5. Inhale: 1, 2, 3. Exhale: 1, 2, 3, 4, 5. (Continue for about a minute) Now let that breathing go and breathe normally. Again, we will try

another round, this time elongating the exhale a little bit. So now, on your next inhale, inhale for a count of 1, 2, 3. And then exhale for 1, 2, 3, 4, 5, 6. Inhale: 1, 2, 3. Exhale: 1, 2, 3, 4, 5, 6. Inhale: 1, 2, 3. Exhale: 1, 2, 3, 4, 5, 6. (Continue for about a minute). Now let that breathing go and breathe normally.

### **Asana Practice (60-65 minutes)**

***Heart bench***

***Sukasana with hands interlaced and pressed up to ceiling***

***Sukasana with side bends***

***Dandasana (staff pose)***

***Paschimottanasana (seated forward bend)***

***Marichyasana III (easy twist)***

***Vasistasana (side plank)*** with bottom knee down for beginners. Do one side and then stay on side to do parigasana. Then switch sides and do vasistasana followed by parigasana.

***Parigasana (gate pose)***

***Balasana (childs pose)*** May need to put blanket or block between feet and buttocks. Also may need to rest head on a block or forearms. (2 minutes)

***Adho mukha svanasana (downward dog)***

***Tadasana (mountain pose)***

***Uttanasana (standing forward bend)***

***Virahbhadsana II (warrior 2)***

***Tadasana***

***Utthita trikonasana (triangle)***- Probably use blocks

***Tadasana***

***Ardha chandrasana (half moon)***

***Don't Do: Parivrtta trikonasana (Revolving triangle)***

***Don't Do: Utthita parsvakonasana (extended side angle pose)***

***Tadasana***

***Parivrtta utthita parsvakonasana (revolving extended side angle pose)***

***Don't Do: Virabhadrasana I (warrior 1)***

***Tadasana***

***Don't Do: Virabhadrasana III (warrior 3)***

***Prasarita paddothanasana (wide legged forward bend)***

***Tadasana***

***Parsvotanasana (intense side stretch)***

***Tadasana***

***Vrksasana (tree pose)***

***Transition to floor with uttanasana, plank and slowly lower***

***Rest on stomach***

***Salabhasana (locust pose)***

***Balasana***

***Eye of the needle/ Pigeon***

***Setu Bandha sarvangasana (bridge pose)***

***Vipariti kirani***

***Reclined spinal twist***

***Meditation, Loving Kindness (reclined) (5 minutes):***

*Explain:* Today we will practice a meditation to cultivate the positive emotion of kindness and compassion, which is the desire for yourself and others to be happy. If you don't feel positive emotions in the meditation, don't worry about it; meditation affects us all differently on different days. Whatever you are feeling, just notice it.

Gently close your eyes and relax your body. Check your body and mind, notice what you are feeling.

Bring to mind someone who, the moment that you think of them, you feel happy. Maybe it is a relative or friend, someone with whom you don't have too complicated of a relationship. Let them come to mind, and feel their sense of being before you. As you imagine them, notice how you are feeling inside. Maybe you feel warmth in the body. This positive emotion is loving kindness, a feeling that is accessible to us all at any moment.

Having this person who makes you feel happy in front of you, wish them well. Wish that they be safe from danger and be protected. Wish that they be happy and peaceful and healthy and strong. Imagine that these positive feelings are reaching out and touching that person. As you are sending out these positive feelings also check in with yourself and see how you are feeling inside.

Now imagine that this person that makes you happy has turned around and is sending back these positive emotions that you have sent out to that person. See if you can receive these positive emotions, just as you have sent them out. Imagine that this person is wishing you well, that this person is wishing that you be peaceful and at ease, safe and protected from danger, joyful and at ease. Let yourself take it all in.

Now, if possible, see if you can send loving kindness to yourself. You can imagine sending this positive emotion from your heart to all areas of your body. Send yourself kindness, happiness, health, and acceptance of where you are at today. Let this loving kindness grow and spread out in all directions to people that you want to send this emotion to, people that you love, people you don't know, people you have difficulty with. Each person that you have touched with this loving kindness is changed and is helped by this positive emotion that you have sent out.

Let us all feel this loving kindness.

***Savasana (corpse pose)*** (5-10 minutes)

After, roll to your right and come up to sitting in sukasana.

### Class 8. Respect others

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

**Take home exercise:** Try out a couple of poses that we have tried here and the compassion meditation that we will try today. The research assistant will give you another handout.

Last week we discussed practicing non-violence or ahimsa to ourselves – in other words taking care of ourselves. This week, we'll extend that idea to also thinking about acting

with ahimsa to those around us, both people and the environment. This means not harming others by either our thoughts, our words or our actions.

This practice of non-violence towards others is more difficult than we think as what do we do when people treat us like shit? It can be very difficult to not respond to others in a cruel way when in fact they have treated us in a cruel way. However, what often happens is that cruelty is a cycle and when we can interrupt cruelty it can stop that cycle.

What is the importance of non-violence towards others and our yoga practice? The thoughts that we have during the day and during yoga practice are not always positive, but can often be negative in nature. As always, we notice that thought, but also do not hold on to it. The more that we practice not staying attached to these thoughts, the more we will let go of these negative thoughts.

So why practice compassion and non-violence towards others? What is in it for you? Treating yourself and others with compassion will make you a happier person. By spending your thoughts on positive ones, you will be treating your body better so that you can live a more healthy and happy life. In so doing you will also affect your environment around you and help the people and place where you live survive and thrive.

**Pranayama/ Asana/ Meditation:** Same as class 7

#### Class 9. Stay present

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

**Take home exercise:** Try out a couple of poses that we have tried here and the compassion meditation that we will try today.

It is difficult to calm the restless mind and stay in the present. There is perhaps nowhere that this is highlighted more than in a yoga class, when during relaxing poses you are sitting in the pose and may find that your mind is prone to wandering. This is no wonder. Our thoughts are colored by innumerable past experiences and thoughts, filled with the people who have been and are currently part of our lives. We don't want to deny this.

So when are these previous thoughts and hopes for the future hurtful to us? When one holds fast to the impressions of objects that one had formerly experienced or hoped for in the future, this can keep us from fully experiencing now. Sad or happy memories can keep us chained to the past.

Today in the yoga class, let's strive to live in the moment. Forget the past and take no thought of tomorrow. Live in the present.

How do we do this? When you find your mind wandering in class today, bring your awareness back to your breathing. Focus on the inhalation and the exhalation. If you find yourself distracted by other people or things that are going on in the room, feel free to

close your eyes. Finally, relax. Like everything in life, Yoga is a journey and learning to be relaxed with yourself will make the whole experience much more enjoyable. Stay present to what you are actually experiencing in each moment on the mat – and just *let it be*.

**Pranayama/ Asana/ Meditation:** Same as class 7

#### Class 10. Gratitude

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

**Take home exercise:** Try out the gratitude meditation that we will try today at the end of class.

Today's yoga class we will consider gratitude, in other words to think about what we are thankful for. Gratitude has a bad rap- it can feel like an obligation to be thankful for something even when we aren't in the thankful mood/ (i.e. feel like crap). Further, it is important to note that gratitude is in no way a denial of life's difficulties or life's injustices. We each experience many challenges and disappointments in life and being thankful should not negate or deny injustice or challenges.

So what is gratitude, why and how do we practice it?

Gratitude helps us turn our mind in such a way that it enables us to live our life and have access to the joy of what is life. The understanding that you get from practicing gratitude frees us from identifying with only the positive or negative aspects of life, and rather lets us meet life in each moment that arises. Cultivating gratitude and thankfulness can help us attain a greater appreciation of life and awareness of life.

So, I will ask you as we begin the class to just take a note of the things that you are thankful for. Let's all start off in heart bench position- one hand on the heart and one hand on the abdomen. As you breath in to your belly, feel your belly rise. Take long slow inhales and exhales through the nose. Close your eyes if that is comfortable to you. Mentally, start to think about things for which you are thankful. Perhaps it is people whom you are thankful for that have provided you with medicine, shelter, safety, food or education. Perhaps you are thankful for basic things, such as air to breathe and water to drink. Perhaps you are thankful for the recent Eagles wins. Making this list is not to feel indebted for these things, but is intended to clarify your understanding of life. It is a practice that works to disrupt our often negative thought patterns that prevent us from appreciating life.

**Pranayama: Viloma pranayama (reclined or sitting) (5 minutes)**

*Explain:* Exhale, emptying your lungs. We will be working on bringing as much breath as possible into the lungs. Take a few breaths normally, inhaling and exhaling through the nose. We will also be practicing the ujjayi breath that we learned a few weeks ago. As a reminder Ujjayi breathing is done by keeping the mouth closed, and just breathing

through the nostrils. It sounds like this. . . (demonstrate). (To get this sound, you have to tighten the throat, so you will sound kind of like Darth Vader from Star Wars. It can be tricky to get down. One way to practice getting the sound is to say the sound “haaah” with your mouth open. Now try making the “haaah” sound with your mouth closed and keep the same throat tightness as you inhale as well.)

Breathe in ujjayi.

Now, on your next inhale, inhale for 2 seconds and hold your breath for 2 seconds.

Again, inhale for 2 and hold for 2. Continue this until your lungs are full and then exhale slowly. Retaining the breath for those 2 seconds should not cause any pressure or tension in the brain or the body. If that occurs, just let it go and breathe normally.

After one round of this, take a few moments to breathe normally.

Then let's do another few rounds. . .

### **Asana**

Same as class 7. If the class is up for it, try headstands instead of vipariti kirani.

### **Meditation: Gratitude (reclined) (5 minutes)**

In this meditation we will think of things in life for which we are grateful. When we think of those things, notice how your body feels. If feelings of gratitude don't come up in the meditation, that's totally fine, you don't need to make yourself feel it. But be open to gratitude if that feeling does come.

First, bring your awareness to your breath. As you inhale and exhale, consider that each of these breaths gives you life, feeling gratitude for this breath. Be aware of your heart beating. Consider that each heartbeat also gives you life.

Bring your attention to what you feel thankful for in your life. Perhaps it is for being alive, for your breath, for the people in your life. . . Bring your attention to people who nourish you in your life. Imagine their presence around you. Feel gratitude for them.

Consider all those things to which you are grateful as you relax into the ground for the next few minutes.

### **Savasana (corpse pose) (5-10 minutes)**

After, roll to your right and come up to sitting in sukasana.

## **Class 11. Coping with Anger**

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

**Take home exercise:** Try out the gratitude meditation that we will try today at the end of class with some of the asanas.

Today I want to talk about the complex emotion of anger, an emotion that we all feel likely at some point in the week if not at some point during the day. Anger can take the form of outrage, frustration, jealousy, resentment, or judgment.

*Ask:* What happens to you when you feel anger or frustration?

*Explain:* As we can see, we all experience anger in different ways. One fairly common characteristic of anger is that we might have an immediate surge of emotion and energy. After that it just puts us in a generally shitty mood and we might then act out at other people and things unrelated to the anger just because we are pissed. Things that might not normally aggravate us now aggravate us. Eventually the anger might go away. However, for some the anger might stick around. And this anger takes a toll on our bodies. It takes away a lot of our energy and we can experience negative health effects as well as just being in a crappy mood.

Is anger ever good? Some might say yes in that it fuels us when our rights are violated, it fuels our efforts to correct societal injustices. People also say that it is not the actual anger that we feel that is the problem, it is how we react to it that is either problematic or ok.

When we feel anger, we don't want to stuff it down but we also don't need to react on it right away. Sometimes just by noticing it and watching it, it will eventually lose power and go away and we realize that the thing we were angry about didn't hold much power. Other times we might need to act in some way, but by thinking about it, we can have a more focused and less explosive way to confront the root of the anger.

Anger is real and should not be disregarded. It is indication of pain that you are in. It should be taken as an opportunity to learn more about yourself and to find out why you are reacting in this way.

So what does this mean for yoga? Asanas can be a good way to move angry energy out of the body. Anger tenses the body, so by relaxing the body through the asanas, we can start to also relax the mind and the anger will decrease.

Today, breathe through any stress or blockages in the muscles. If there are any irritations going on in your life, don't focus or hold on to them. Breathe and let them go.

**Pranayama/ Asana/ Meditation:** same as class 10

**Class 12. Accomplishment and continued practice**

*Ask:* Any injuries? Anyone able to try out any of the postures or meditations at home?

Constant practice is emphasized in yoga as a way to achieve the full benefits of yoga. Just like anything, you need to practice it in order to reap the benefits of it. Today, we celebrate the conclusion of our yoga practice together and all of the effort that you have



displayed thus far. You have all displayed patience, and effort in all the work that you have done in this class. I appreciate the hard work that you have displayed and your willingness to try out the different postures and meditations that we have tried.

As with any accomplishment and this is a great accomplishment, you should feel proud of yourself. I encourage you to take with you the practices that you have enjoyed. We will celebrate your accomplishments tonight by ending a little early and share some snacks together and there will also be a list of places in the community where you might like to practice yoga.

### ***Asana/ Meditation Practice***

Same as class 7. No pranayama practice.

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<http://www.yogajournal.com/article/teach/teaching-ujjayi-breath/>

<http://www.chopra.com/ujjayi-breath>

## APPENDIX C

### YOGA CLASS FOUR HANDOUT

**Meditations (body scan):** Go to the below website links and play the audio recordings

3 minutes:

<http://marc.ucla.edu/mpeg/Body-Scan-Meditation.mp3>

20 minutes:

[http://health.ucsd.edu/av/mindfulness/20\\_Min\\_Body\\_Scan3.mp3](http://health.ucsd.edu/av/mindfulness/20_Min_Body_Scan3.mp3)

**Some yoga poses:**

Try **childs pose (balasana)** to relax and gently stretch your back:

- Sit comfortably on your heels. (If it is not comfortable to sit on your heels, put a pillow in between your butt and your heels.)
- Lower your chest as close to your knees as is comfortable.
- Rest your head on the ground or your forearms or a pillow if that is more comfortable.

Try **warrior 2 (virabhadrasana)** to strengthen and stretch your legs:

- Stand with [legs](#) 3 to 4 feet apart, turning right foot out 90 degrees and left foot in slightly.
- Extend arms out to the sides, palms down.
- Bend right knee 90 degrees, keeping knee right over ankle; gaze out over right hand.
- Switch sides and repeat.

Try **triangle pose (trikonasa)** to open your chest and shoulders:

- Stand with feet about 3 feet apart, toes on your right foot turned out to 90 degrees, left foot turned out to 45 degrees.
- Allow your right hand to rest on your right leg below or above the knee, and extend the fingertips of your left hand toward the ceiling.
- Turn your gaze toward the ceiling, only if that is comfortable for your neck.
- Repeat on other side.

Try **corpse pose (savasana)** to fully relax your body and mind:

- Lie on your back and relax your arms by your side and legs outstretched. If your lower back is tight then bend your knees or place a blanket or pillows underneath your knees.
- Close your eyes. Relax all body muscles. Allow your mind to relax.

Reference: <http://files.shroomery.org/cms/Ashtanga%20Yoga%20Teacher%20Training%20Manual.pdf>

## APPENDIX D

### YOGA CLASS EIGHT HANDOUT

To strengthen your core and hips, try **staff pose (dandasana)**:

- Sit on the floor with your legs extended out in front of you.
- Flex your feet.
- Roll your shoulders back so you are not slouching.
- If you have tight hamstrings, sit on a blanket.
- If it is difficult to sit up, practice with your back against the wall.
- Don't practice this pose if you have a lower back injury

To stretch the back, shoulders and hamstring, try **seated forward bend (paschimottanasana)**:

- Start in staff pose (above pose).
- Lean forward from the hip joints.
- Reach towards your feet. If your hands don't reach your feet, let them rest on your legs. Don't force yourself to touch your feet.
- If you have tight hamstrings, sit on a blanket.
- Don't practice this pose if you have a lower back injury.

To strengthen and stretch the spine, try a **twist (marichyasana)**:

- Start in staff pose (see first page).
- Bend your right knee and put the foot on the floor.
- Lengthen your spine (try not to slouch).
- Rotate your torso to the right and wrap your left arm around the right thigh.
- Place your right hand behind you on the floor.
- Gently turn your head to the right.
- Repeat on the other side.
- Try it sitting on a blanket if it is hard to sit up straight.

To strengthen the arms and core, try **side plank (vasistasana)**:

- Rest on your right side with your right arm extended and right hand resting on the ground.
- Place your right knee on the ground and extend out your left leg (modified pose).
- Stretch left arm up and look at the left hand.
- If you feel comfortable there, you can extend the right leg also so that both legs are extended.
- Balance on your right hand and right foot.

- Don't practice this pose if you have any wrist, elbow or shoulder injuries.

Try **corpse pose (savasana)** to fully relax your body and mind:

- Lie on your back and relax your arms by your side with legs outstretched.
- If your lower back is tight, bend your knees or place a blanket or pillows underneath your knees. Close your eyes. Relax your body and mind.

References:

<http://files.shroomery.org/cms/Ashtanga%20Yoga%20Teacher%20Training%20Manual.pdf>, <https://www.yogaoutlet.com/guides/how-to-do-side-plank-pose-in-yoga>  
<http://shlok.mobi/yoga/Marichasana>  
<http://yogawithsubhash.com/2014/01/24/five-asanas-for-tight-hamstrings/>  
<https://asanayear.wordpress.com/2012/05/28/dandasana-staff-pose/>

## APPENDIX E

### THREE-MONTH QUALITATIVE INTERVIEW QUESTIONS

#### **Interview Procedures:**

The following questions will be asked at the three-month post-baseline interview, following the Time Line Follow Back. While the following questions will be addressed in each individual interview, the exact wording and timing of the questions may differ depending on the interviewee's unique experiences.

#### **Interview Questions:**

##### ***Yoga:***

1. When you hear the word yoga, what do you think of?
2. What would your friends and family say about yoga?
3. Have you seen yoga classes offered in your community? If yes, are those classes welcoming to community members?
4. Have you attended yoga classes outside of this study? If yes, what did you think about the classes? How did you feel after taking the classes?
5. For people who participated in the yoga intervention of the study:
  - What were your overall impressions of the yoga classes?
  - How did you feel after taking the classes?
  - What did you like about the classes?
  - What did you dislike about the classes?
  - Did you practice anything you learned in the yoga classes outside of class? If yes, what did you practice?
  - Were there some poses that were more difficult for you than others- if so, which ones?
  - How did you feel after doing more difficult poses versus easier poses?
  - Did the teacher support you in doing difficult poses and/or modifying difficult poses for you?
  - Which activity did you most prefer, pranayama (breathing exercises), meditation, or asanas (physical postures)?
  - On days when you felt more stress (were having a difficult day), what was it like taking the yoga classes?
  - On days when you were experiencing more side effects from your ART medications, what was it like taking the yoga classes?
  - What was the leading reason that you did not attend classes?

- What was the leading reason that you did attend classes?
- How do you think the yoga classes affected your substance use? Your ART adherence?
- How likely are you to continue to attend yoga classes?
- What would you tell your friends and family about yoga?
- Any final thoughts or recommendations about how to improve the yoga classes?

## APPENDIX F

### CODES GENERATED FROM QUALITATIVE ANALYSIS

#### **Yoga\_stereotype**

Things that a person associates with a practitioner of yoga or about yoga practice. This could be in response to the question: "when you hear the word yoga, what do you think of?"

For example: "Yoga is about contorting the body."

#### **Yoga\_effects**

The way that yoga makes a person feel after practice. Often in response to the question: "how did you feel after yoga classes?" or "Did you feel different after doing easy versus difficult poses?"

For example:

"After I take the class I always felt focused. I always felt more um, here and now. I felt relaxed, I felt energy, I felt that I [starts snapping fingers] purpose, that I—this is what I need to do today and this is what I'm going to do [stops snapping fingers] and it overflowed into Tuesday."

#### **Yoga\_effects+spirituality**

Participant felt like yoga had an effect on their spirituality.

For example: "I felt- like spiritually, I felt good."

#### **Yoga\_family & friends**

Response to the question "what would your family and friends say about yoga?"

For example:

"P: Um... I don't know. I think—when I told my friend I was practicing yoga they always was like "I don't know if I can be that calm for that long".

#### **Yoga\_in the community**

Response to the question: "Have you seen yoga classes offered in your community?"

For example:

"I: Have you seen yoga classes offered in your community?

P: No. "

#### **Yoga\_likes**

what a person liked about the yoga classes. This could have been in response to the question: "what are your overall impressions of the classes/ what did you like about the classes" or "Which activity did you prefer: physical postures, pranayama breathing or meditation."

For example:

"P: I thought—I thought the class was good. It was a good experience"

### **Yoga\_dislikes**

Anything that person did not like about yoga classes and could have been in response to the question whether the person disliked anything about the classes.

For example:

"P: Just like I wish we had more."

### **Yoga\_instructor**

overall impressions of the yoga teacher

For example:

"the teacher was excellent. He was patient, he pushed you. Um, they have days that he didn't push us that much but he still made you do what you wanted to do."

### **Yoga + recommendations**

Any advice that person had to improve the yoga classes

For example:

"P: I wish there was a Monday, Wednesday, Friday kinda thing."

### **Yoga + substance use**

Ways in which the participant thinks that yoga supports substance use recovery or not.

Maybe in answer to the question: "Do you think yoga affected your substance use?" For example: "Yoga slowed down my substance use."

### **Yoga\_practice outside class**

Activities learned in yoga class that were practiced outside of class. (Often in answer to the question: 'did you practice anything that you learned in class, outside of class?') or in answer to the question "how likely are you going to continue to take yoga classes in the community?" For example, one participant talks about practicing reclined spinal twist.

### **Yoga\_poses**

Descriptions of difficult or easy poses. (Often in answer to the question: were some poses more difficult for you than others?" For example, one participant answers to the question regarding whether any of the poses were difficult with: "when you have to twist your body up a lot. . . but the upper body stuff I can definitely do. . . It's interesting how everybody's different."

### **Yoga + stress**

Ways in which yoga did or did not affect stress levels. This could be in answer to the question: "On days that you were having a difficult day (felt more stress in your life), what was it like to attend yoga class?"

For example, in response to the above question one participant described a situation in which yoga class made him calm down from a stressful situation so that he was able to deal with the situation more effectively: "releasing the negative energy and having a plan."



**Yoga\_attendance**

Why people could or could not attend yoga class. Often in response to the questions: “what were the leading reasons why you did/ did not come to yoga class?”

For example: “I didn’t be here some days when I didn’t feel like getting up. I had a rough weekend. . .”

**Yoga\_breathing.** Any comments about yoga breathing. For example: liked breathing exercises.

**Yoga\_meditation.** Any comments about yoga meditation. For example: did not like meditation.

## **APPENDIX G**

### **ADJUSTMENTS TO YOGA CURRICULUM**

#### **Wave One**

Adherence to the yoga curriculum was maintained except in classes six and nine, when a Restorative yoga class was substituted. Poses included the following:

Heart bench with legs in butterfly (bound angle pose)

Bananasana (reclined side stretch)

Dragonfly (wide-legged forward fold)

Square pose (fire log pose with one shin in front)

Caterpillar (seated forward fold)

Reclined twist

Savasana (corpse pose)

#### **Waves Two- Four**

The instructor adjusted the curriculum to include more restorative poses. Classes included 55 minutes of active asanas, 25 minutes restorative asanas and 10 minutes of relaxation and meditation.

Pranayama: deep breathing, sometimes with a count and sometimes with a short retention on the inhale.

Mountain Pose

Standing Side bends (sometimes called half moon)

Chair Pose

Warrior 1 and 2

Tree pose

Downward Dog

Cobra

Locust

Standing wide legged fold

Squat (often modified)

Standing forward fold

Seated forward fold

Seated spinal twist

Head to knee pose

Happy baby pose

Plow variations

Heart bench

Savasana

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